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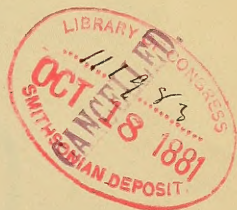
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VOL. IX.



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OF

THE LINNEAN SOCIETY.

Synopsis of the Diptera of the Eastern Archipelago discovered by Mr. WALLACE, and noticed in the 'Journal of the Linnean Society.' By F. WALKER, Esq., F.L.S.

[Read June 1, 1865.]

THE synopsis which follows these notes is arranged like Mr. Smith's tabular geographical view of the Hymenoptera of the Eastern Archipelago in the Seventh Volume of the 'Journal of the Linnean Society.' The synopsis only contains the species discovered by Mr. Wallace; and the districts may be mentioned in the following order:—

Malacca, with Mount Ophir, affords 51 species, and Singapore 67 species. Borneo comes next in succession, passing by Sumatra and Java, where the fauna is generally very distinct from that of the rest of the archipelago. Only 129 species are recorded from Borneo, and this extensive region is very inadequately represented. In Celebes the species collected amount to 236. Amboyna comes next; and several species of this island have been recorded by Dr. Doleschall, in addition to the 50 species collected by Mr. Wallace. Aru supplies 166 species; Batchian contributes 75 species; and New Guinea, the most eastern district, enumerates above 70. The other isles have been so little investigated that they may be passed over without notice.

About 300 species of Philippine Diptera have been lent to me by Professor Bellardi, and a very large proportion of them are undescribed.

The following families are not referred to in these notes; for their occurrence in the archipelago is as yet nearly or entirely

unknown:—Mycetophilidæ, Cecidomyzidæ, Bibiomidæ, Simulidæ, Chironomidæ, Phlebotomidæ, Heteroclitæ, Rhyphidæ, Empidæ, Cestridæ.

The gnats or mosquitoes (or *Culicidæ*) are represented in these isles by 12 species of *Culex*, 2 of *Megarhina*, and 1 of *Anopheles*. The genus *Culex* is found throughout the world, and has probably continued from very early ages as compared with many other genera of insects. The species of different countries have much mutual resemblance, with the exception of a few that are peculiar to warm regions; and it is remarked by Humboldt that in some parts of South America each stream has its peculiar species. The genus *Megarhina* is especially South American, and does not appear in Africa, nor on the continent of Asia, nor in Australia.

Tipulidæ.—Of the seven genera in the following list, two (*Limnobia* and *Tipula*) are distributed throughout the world; and the *Limnobiæ* here recorded are very few, and it is probable that there are numerous undiscovered species in the eastern isles. *Limnobia* is a remarkable group, on account of the variation of the structure of the wing-veins being nearly equal to the number of species, which is very great. It will be divided into very numerous genera; and Baron Osten-Sacken has taken the lead in this part of systematic entomology with regard to the North American species. He has discovered in North America several species which in England are represented by *Geranomyia*; and he regards these as the remains of an earlier creation, which has mostly passed away in Europe, its former existence being indicated by fossils. *Geranomyia* is a native of the sea-coast, and is found, with *Orphnephila*, in the Channel Isles and in the western parts of Great Britain; and these two genera, like the little *Chironomus* that hovers over sea-weed, may have lived on the shores of the former Atlantic continent. The species of *Tipula* and of *Pachyrhina* here recorded are few in number, and are not peculiar in structure. *Megistocera* is an Australian genus, and is remarkable for the very great length of the antennæ of the male. The species in this list has been long known as a native of Java; and Mr. Wallace has discovered it in Aru. *Ctenophora* is generally distributed; but *Pterocosmus* is a new genus, founded on five species from Borneo; and *Gymnoplusia*, which was before only known in Australia, is represented by three species.

Stratiomidæ.—This family is very diversified in the isles, and is represented by 26 genera, of which 16 are new. The species of these new genera are of comparatively small size, and in them the

characteristics of the family are not much developed. *Ptilocera* appears to be peculiar to these isles and to South Africa; and *F. quadridentata* is the only Dipterous insect that has been found in almost all the islands here mentioned. *Clitellaria*, *Cyclogaster*, *Stratiomys*, *Oxycera*, *Chrysomyia*, and *Sargus* are widely distributed. Of *Eudmeta* only one species is known; and it occurs in Hindostan, Singapore, Sumatra, and Java. *Phyllophora* was founded on a West African species, and Singapore is its only other locality. *Hermetia*, to which *Massicyta* may be united, is especially a South American genus, and has not been discovered in Africa, nor on the continent of Asia.

Xylophagidæ.—It is doubtful whether this family has been discovered on the archipelago; for perhaps *Rhyptomorpha* may not belong to it. This is very different from all other genera, though it has some resemblance to the North American genus *Rachicerus*.

Tabanidæ.—One species of *Pangonia*, a genus that abounds in Australia, has been discovered in the archipelago. *Tabanus* is especially characteristic of continents, and the species appear to have been multiplied since the continents were established by the joining together of islands. About 600 species of this genus have been recorded. *Chrysops* and *Hæmatopota* are nearly as widespread as *Tabanus*; and *C. dispar* is among the few of these insular species that appear also on the continent of Asia.

Asilidæ.—The *Dasypogonites* are of rare occurrence; they are represented only by 13 species and by 4 genera (*Mydas*, *Discocephala*, *Dasypogon*, and *Dioctria*), all of which are found in several other regions. In the *Laphrites*, the numerous species of *Laphria* here recorded are the most remarkable features in the Dipterous fauna of these islands. By far the greater part of them are of the metallic-coloured group, which has very few representatives in other parts of the world. Most of the species are very closely allied to each other, and some of them will probably be considered mere varieties. Perhaps the connecting links will disappear by degrees, and the remainder will then be recognized as isolated or clearly defined species; or, in botanic phrase, the segregate species which compose the aggregate species will partially cease, and the true species will continue or will be more evident. It is well known that some regions of the earth represent now the earlier state of other regions; and in like manner the preparatory establishment of species may be observed in some districts, while there are no traces of such a process in other districts. Among the *Asilites*, the genera *Trupanea* and *Ommatius* are nearly limited to

the warmer parts of the earth; and several species of them inhabit these isles. *Asilus* and *Leptogaster* are generally distributed, and the former contains a vast number of species: of the few here mentioned, all are new, excepting *A. longistylus* and *A. Barium*; and the geographical range of the latter extends to Ceylon. In Aru there is one species of the Asiatic genus *Damalis*.

The *Bombylidæ*, so various in form, are very scarce in these isles, and appear only in four genera—*Therma*, *Anthrax*, *Geron*, and *Systropus*; the last is a widely spread genus, but contains very few species. In this family the archipelago especially differs from Australia, and has no representatives of the peculiar forms and of the large number of species that inhabit the latter region.

The *Leptidæ* comprise a few species belonging to *Leptis*, *Chrysopila*, and *Suragina*, of which genera the last one is new, and contains two species from Gilolo.

In the *Dolichopidæ* there are many species belonging to *Psilopus*, *Dolichopus*, *Diaphorus*, and *Chrysotus*; and as all the species of this family are of small size, it is probable that they are much more numerous.

Lonchopteridæ.—It is doubtful whether the new genus *Cadrena* belongs to this family.

The *Platypezidæ* and the *Pipunculidæ* are each limited to one species. *Pipunculus* has been found in Amboyna; it also occurs in Australia.

Syrphidæ.—Some genera of this family are selected for notice. *Ceratophya* was discovered by Dr. Doleschall; it was before only known in North America. The species of *Ceria* are very few; yet five of them are contained in this list, and four of these are new. The species described as *C. lateralis* is *C. indica*. The genus *Eristalis* contains four of the few Dipterous species whose geographical range extends beyond the archipelago. *E. Amphicrates* inhabits Hindostan and China; *E. Andræmon* and *E. æneus* inhabit Hindostan; and *E. arvorum* inhabits China. *Baccha Amphithoë* and *Ascia brachystoma* are also natives of Hindostan; so also are *Syrphus ægrotus* and *S. alternans*; and *S. ericetorum* inhabits Africa.

Conopidæ.—One species of *Conops* was discovered by Dr. Doleschall; it has little affinity to the Australian representatives of the genus.

Muscidæ.—Several of the subfamilies of this most extensive group are very slightly represented in the list; but it is probable that a large number of new species will be discovered.

The *Tachinides* amount to less than 60 species. This number appears very small when it is considered that the European species of these parasitic Muscidæ are excessively numerous. They are in exact contrast to the *Muscides*—where the species are comparatively few, but occur in immense swarms; whereas in the *Tachinides* the species appear to be interminable, but none of them are in any abundance. In this the *Tachinides* resemble some tribes of parasitic Hymenoptera, and, like them, may have been diversified in character by the numerous kinds of insects on which they are parasitic. *Hamaxia* and *Zambesa* are the only two new genera. *Megistogaster Imbrasus* inhabits China as well as Borneo.

Dexides.—*Rutilia* may be mentioned as indicating in some of the isles an approach to the Australian fauna, this genus being restricted to the archipelago and to Australia. It is the largest in size, and the most brilliant in colour, of all the Muscidæ. Felder has named a genus of *Rhopalocera* after Dr. Doleschall; and as my genus *Doleschallia* is very closely allied to *Torocca*, I have united these two genera, and have annulled the former name.

Sarcophagides.—*Sarcophaga*, the type of this tribe, is very widely distributed, and the species have much mutual resemblance. *S. ruficornis* inhabits Hindostan and Malacca; and all the other species in this list are merely insular.

Muscides.—*Idia* is limited to the warmer regions of the Old World, and of the species here mentioned some have a wider range than the generality of these Diptera: thus, *Idia australis* is found in Australia, *I. xanthogaster* in Hindostan, and *I. testacea* in the Mauritius. Two of the species of *Musca* have been already described, and inhabit also Hindostan; the rest are new, and some of them are indicated as new subgenera. *Musca domestica* is omitted from the list.

Anthomyides.—These may be passed over without notice, as it is probable that only a very small part of them are yet discovered, and that they have been neglected on account of their small size and dull colour; and the same remark will apply to the *Helomyzides*, the *Borborides*, the *Lauxanides*, the *Ascinides*, the *Geomyzides*, the *Phytomyzides*, and the *Hydromyzides*. In the *Helomyzides*, the occurrence of *Cœlopa* may be mentioned as that of a genus which seems to be nearly peculiar to other regions. It swarms on the northern shores of Europe; but in the Channel Isles it is scarce, and another genus replaces it on the sea-weed.

The *Celyphides* are closely allied to the *Lauxanides*, and are

very remarkable on account of the development of the scutellum, whereby these flies have the semblance of beetles. Their range extends from Hindostan through the archipelago to the Philippine Isles.

Ortalides.—This subfamily is remarkable on account of the great variety of its forms, the beauty of its colours, and the elegant markings on the wings of many species. Thirteen new genera have been established on the insular species—*Xangelina*, *Xiria*, *Poticara*, *Mystia*, *Callantra*, *Aragara*, *Sophira*, *Rioxa*, *Valonia*, *Brea*, *Adrama*, *Polyura*, and *Strumeta*. A few of the other genera require some notice. A species of *Oxycephala* inhabits Ceram; but elsewhere the genus is only known to occur in North America. *Lamprogaster* is abundant in Australia; and the species of it in Malacca, Singapore, and some of the isles exhibit a resemblance to the Australian fauna. A few of the insular species are very remarkable on account of the great breadth of the head; and they form the genus *Zyganula* of Doleschall, or *Pterogenia* of Bigot. The genus *Dacus* abounds in the isles; and several of the species, like the *Laphriæ*, are very closely allied to each other, and have much resemblance to the species of Hindostan and of Ceylon. The very extraordinary genus *Achias* attains its greatest development in Aru: some future investigation may lead to the discovery of the use of the long petioles on which its eyes are seated.

Diopsides.—The singularity of the eyes of *Diopsis* has been too often described to require any notice here. The genus extends from Africa to the Philippine Isles.

Sepsides.—The genus *Colobata* is very generally distributed, and is rather numerous in these isles; and the species, though natives of widely separated regions, have much mutual resemblance. Some of the species of *Sepsis* have a great likeness to the British species, which occur now and then in immense swarms. The genus *Angitula* was established on the female of *Elaphomyia*, Saunders (*Phytalmia*, Gerstäcker). The female was transmitted to England long before the horned male of this most peculiar genus was known. The typical *Elaphomyiæ* are not mentioned in the list, as I have not described them; but the one species here recorded differs widely from the others, and I have transferred to it the generic name *Phytalmia*.

Psilides.—The species are few in number, but contain four new genera—*Cœnurgia*, *Texara*, *Seraca*, and *Gobrya*.

The known species of the *Phoridæ*, like those of the preceding group, are almost wholly European, and only two have been found in the archipelago. The *Hippoboscidæ* require no notice.

[illegible]

	China.	India.	Philippines.	Malacca.	Borneo.	Singapore.	Gilolo.	Ternate.	Sumatra.	Java.	Waigiu.	Bachian.	New Guinea.	Salwatty.	Celebes.	Ceram.	Amboyua.	Sula.	Gorrite.	Key.	Aru.	Kaisaa.	Mysol.	Solomon's Isles.	Australia.	Africa.	Ceylon.	Corea.
Cyclogaster																												
detracta					*																							
infera					*																							
Aulana																												
confirmata																							*					
Phyllophora																												
angusta						*																						
Eudmeta																												
marginata		*				*			*	*																		
Ampsalis																												
geniata															*													
Massicyta																												
bicolor						*																						
inflata												*																
cerioides							*														*	*						
Hermetia																												
remittens															*													
rufiventris															*		*											
Culcua																	*											
simulans					*																							
Evaza																												
bipars					*																							
Nerua																												
scenopinoides											*	*				*					*							
impendens															*													
Solva																												
inamœna															*													
hybotoides						*									*													
Adraga																												
univitta																					*	*		*				
Salduba																												
diphysoides																					*							
hilaris												*										*						
lugubris												*																
melanaria												*																
scapularis												*																
singularis												*																
gradiens																							*		*			
areolaris																							*		*			
Gabaza																												
argentea																					*							
Oxycera																												
manens														*														
Musama																												
paupera																							*					
Tracana																												
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Obrapa																												
perilampoides											*	*									*	*	*					
celyphoides											*	*									*							
Rosapha																												
habilis		*												*														
Ruba																												
inflata														*														

[illegible]

	China.	India.	Philippines.	Malacca.	Borneo.	Singapore.	Gilolo.	Ternate.	Sumatra.	Java.	Waigiu.	Bachian.	New Guinea.	Salwaty.	Celebes.	Ceram.	Amboyna.	Sula.	Gorrite.	Key.	Aru.	Kaisaa.	Mysol.	Solomon's Isles.	Australia.	Africa.	Ceylon.	Corea.	
Tabanus																													
succurvus	*
doreicus
recusans
obscuratus
serus
factiosus
reducens
exagens
spoliatus
facilis
immixtus	*
extricans	*
flexilis
insurgens	*
cohaerens	*
papouinus	*
breviventris	*
sylvioides	*	*
humillimus	*
simplicissimus	*
Chrysops																													
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fasciatus	*	*
fixissimus	*
signifer	*
parallelus	*
Hæmatopota																													
roralis	*
atomaria	*
Mydas																													
basifascia	*
Discocephala																													
dorsalis	.	.	.	*	*
pandens
concolor
Dasypogon																													
vica	.	*	.	.	*
incomptus	*
inopinus	*
honestus	*
glabratus	*
congressus	*
solutus	*
semifilatus	*
indecorus	*
Dioctria																													
claviventris	*
Laphria																													
paradisiaca	*
gloriosa	*	*
liturifera	*
congrua	*	.	.	.	*	*

	China.	India.	Philippines.	Malacca.	Borneo.	Singapore.	Gilolo.	Ternate.	Sumatra.	Java.	Waigiu.	Bachian.	New Guinea.	Salwatty.	Celebes.	Ceram.	Amboyna.	Sula.	Gorrite.	Key.	Aru.	Kaisaa.	Mysol.	Solomon's Isles.	Australia.	Africa.	Ceylon.	Corea.
Laphria																												
consurgens													*															
socia								*					*		*	*	*	*										
Taphius			*										*		*	*	*	*										
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auribasis											*	*	*		*	*	*	*				*	*	*	*			
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bipars											*	*	*		*	*	*	*				*	*	*	*			
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pipunculoides										*	*	*	*		*	*	*	*				*	*	*	*			
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alternans				*	*	*	*			*		*	*		*	*	*	*				*	*	*	*			
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inaurea				*	*	*	*			*		*	*		*	*	*	*				*	*	*	*			
basigutta				*	*	*	*			*		*	*		*	*	*	*				*	*	*	*			
fusifera				*	*	*	*			*		*	*		*	*	*	*				*	*	*	*			
sobria				*	*	*	*			*		*	*		*	*	*	*				*	*	*	*			
plana				*	*	*	*			*		*	*		*	*	*	*				*	*	*	*			

	China.	India.	Philippines.	Malacca.	Borneo.	Singapore.	Gilolo.	Ternate.	Sumatra.	Java.	Waigiu.	Bachian.	New Guinea.	Salwatty.	Celebes.	Ceram.	Amboyna.	Sula.	Gorrite.	Key.	Aru.	Kaisaa.	Mysol.	Solomon's Isles.	Australia.	Africa.	Ceylon.	Corea.	
Laphria						*																							
imbellis
notabilis	*
orcus	*
elegans	.	*	.	.	*	*
radicalis	*	*
triangularis	*	.	.	*
constricta	*	*
unifascia	*	*
comptissima	*	*
rudis	*	*
producta	*	*
lepida	*	*
completa	*	*
incivilis	*	*
partita	*	*
interrupta	*	*
cingulifera	*	*
detecta	*	*
Trupanea																													
Amorges	*	*	*
inserens	*	*
Plutonica	*
strenua	*
contradicens
complens	*	*
interponens	*	*
addens	*
transacta	*	*
Gilolana	*
calorifica	*
concolor	*
Asilus																													
lineosus	*	*
latifascia	*
fusiformis	.	.	.	*
debilis	.	.	.	*	*
Barium	.	.	.	*	*	.	.	.	*
flagrans	.	.	.	*	*	*
contortus	.	.	.	*	*	*
areolatus	*	*
areolaris	*
mendax	*
strenuus	*	.	*
depulsus	*	.	*	*
superveniens	*	*
biligatus	*
tenuicornis	*	.	*
laevis	*
didymoides	*	*	*
normalis
longistylus	*	*
introducens	*	*
determinatus	*	*

	China.	India.	Philippines.	Malacca.	Borneo.	Singapore.	Gilolo.	Ternate.	Sumatra.	Java.	Waigiu.	Bachian.	New Guinea.	Salwatty.	Celebes.	Ceram.	Amboyna.	Sula.	Gorrite.	Key.	Aru.	Kaisaa.	Mysol.	Solomon's Isles.	Australia.	Africa.	Ceylon.	Corea.
Anthrax																												
apicifera													*															
Geron																												
simplex																												
Systropus																						*						
sphécoides															*													
Hybos																												
bicolor													*															
deficiens													*							*								
Epiceia																												
ferruginea												*	*			*	*							*				
stigma												*	*			*	*							*				
Leptis																												
decisa				*	*																							
ferruginosa			*		*							*	*		*	*	*					*	*	*				
impar												*	*		*	*	*					*	*	*				
Suragina																												
illucens															*													
signipennis							*																					
Chrysopila																												
maculipennis					*																							
vacillans												*										*						
guttipennis												*										*						
stylata																							*					
Psilopus																												
robustus					*	*																						
tenebrosus					*	*																						
posticus				*																								
clarus				*																								
subnotatus				*																								
apicalis					*				*																			
allectans					*	*																						
alliciens					*	*																						
illiciens					*	*																						
delectans					*	*																						
proliciens					*	*																						
prolectans					*	*																						
colliciens					*	*																						
derelictus					*	*																						
lucigena													*	*	*							*	*	*				
æneus										*			*	*	*							*	*	*				
spectabilis													*	*	*							*	*	*				
variipennis												*	*	*	*							*	*	*				
extendens												*	*	*	*							*	*	*				
benedictus												*	*	*	*	*	*					*	*	*				
persuadens												*	*	*	*	*	*	*				*	*	*				
seticornis												*	*	*	*	*	*	*				*	*	*				
terminifer												*	*	*	*	*	*	*				*	*	*				
subrectus												*	*	*	*	*	*	*				*	*	*				
æstimatus												*	*	*	*	*	*	*				*	*	*				
flavicornis									*			*	*	*	*	*	*	*				*	*	*				
perficiens												*	*	*	*	*	*	*				*	*	*				
egens												*	*	*	*	*	*	*				*	*	*				
moderatus												*	*	*	*	*	*	*				*	*	*				

	China.	India.	Philippines.	Malacca.	Borneo.	Singapore.	Gilolo.	Ternate.	Sumatra.	Java.	Waigou.	Bachian.	New Guinea.	Salwatty.	Celebes.	Ceram.	Amboyna.	Sula.	Gorrite.	Key.	Aru.	Kaisaa.	Mysol.	Solomon's Isles.	Australia.	Africa.	Ceylon.	Corea.
Eristalis																												
splendens											*	*	*			*	*	*						*				
resolutus													*															
inscripta													*				*	*										
obliterans													*				*											
bomboides													*		*		*											
obscurata													*															
tortuosa													*															
lucilioides												*			*													
muscoïdes													*								*	*	*	*	*			
erythropyga													*															
postscripta													*									*	*	*	*			
conductus													*								*	*	*	*	*			
aequipars													*								*	*	*	*	*			
placens													*								*	*	*	*	*			
Agno													*				*						*	*	*	*		
Æsopus		*											*		*		*									*		
suavissimus													*				*					*	*	*	*			
inficitus												*			*							*	*	*	*			
helophiloides												*										*	*	*	*			
merodontoides												*				*												
crassus		*										*		*		*							*	*	*	*		
Helophilus																												
insignis				*	*	*	*																					
quadrivittatus		*			*	*																*	*					
mesoleucus																						*	*					
consors															*							*	*					
conclusus															*													
Xylota																*												
conformis					*	*																						
ventralis																					*	*						
Eumerus																												
figurans													*		*													
argentipes												*																
Merodon																												
varicolor					*																							
interveniens															*													
Orthoneura																												
basalis																					*	*						
Paragus																						*						
substitutus												*																
latiusculus												*			*													
venosus												*	*	*	*													
luciferus												*	*	*	*													
incisuralis												*	*	*	*													
Baccha																												
Amphithoë		*			*											*												
dispar																*												
basalis												*	*	*	*													
incisa												*	*	*	*													
tripartita												*	*	*	*						*	*	*	*	*			
purpuricola												*	*	*	*						*	*	*	*	*			
Ascia																												
brachystoma		*			*																							

	China.	India.	Philippines.	Malacca.	Borneo.	Singapore.	Gilolo.	Ternate.	Sumatra.	Java.	Waigiu.	Bachian.	New Guinea.	Salwaty.	Celebes.	Ceram.	Amboyna.	Sula.	Gorrite.	Key.	Aru.	Kaisaa.	Mysol.	Solomon's Isles.	Australia.	Africa.	Ceylon.	Corea.
Masicera																												
solennis
simplex
guttata
ficta
prognosticans
Eurygaster																												
muscoides
subferrifera
limitaris
mutans
remittens
ridibunda
tentans
figens
conglomerata
prominens
interdicta
apta
deducens
contracta
progressa
phasioides
decipiens
Trichoprosopa ?																												
divisa
marginalis
Megistogaster																												
Imbrasus
Metopia																												
inspectans
instruens
Phorocera																												
expellens
decedens
basitincta
convertens
Zambesa																												
ocypetroides
Dexia																												
divergens
munda
extendens
fusiformis
basifera
nivifera
includens
parallela
præcedens
alulifera
cylindrica
pectoralis
Rutilia																												
saturatissima

	China.	India.	Philippines.	Malacca.	Borneo.	Singapore.	Gilolo.	Ternate.	Sumatra.	Java.	Waigiu.	Bachian.	New Guinea.	Salwatty.	Celebes.	Ceram.	Amboyna.	Sula.	Gorrite.	Key.	Aru.	Kaisaa.	Mysol.	Solomon's Isles.	Australia.	Africa.	Ceylon.	Corea.
Rutilia																												
plumicornis													*															
fervens							*					*	*															
pectoralis												*	*															
glorificans												*	*															
Moneta											*	*	*															
lucigena											*	*	*															
atribasis								*			*	*	*															
complicita											*	*	*									*						
angustipennis											*	*	*			*						*						
sapphirina							*				*	*	*									*						
excelsa							*	*			*	*	*									*						
volucelloides							*				*	*	*									*						
trixoides							*				*	*	*							*		*						
ignobilis											*	*	*									*						
Gymnostylia													*															
invita							*				*	*	*									*						
luteicornis							*				*	*	*									*						
Prosera											*	*	*									*		*				
pectoralis											*	*	*									*		*				
argentata											*	*	*									*		*				
lurida											*	*	*									*		*				
coacta											*	*	*			*						*		*				
secedens											*	*	*			*						*		*				
fasciata											*	*	*			*						*		*				
Torocca											*	*	*			*						*		*				
abdominalis											*	*	*		*							*		*				
gonypedoides											*	*	*		*							*		*				
cylindrica											*	*	*		*							*		*				
consors											*	*	*		*							*		*				
Cynomyia											*	*	*		*							*		*				
fortis					*						*	*	*		*							*		*				
Sorocophaga											*	*	*		*							*		*				
ruficornis	*	*	*	*	*	*					*	*	*		*							*		*				
reciproca		*	*	*	*	*					*	*	*		*							*		*				
aliena		*	*	*	*	*					*	*	*		*							*		*				
indicata		*	*	*	*	*					*	*	*		*							*		*				
sericeo-nitens		*	*	*	*	*					*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*
aurata		*	*	*	*	*					*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*
compta		*	*	*	*	*					*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*
invaria		*	*	*	*	*					*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*
mendax		*	*	*	*	*	*				*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*
brevis		*	*	*	*	*	*				*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*
innotata		*	*	*	*	*	*				*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*
basalis		*	*	*	*	*	*				*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*
perpusilla		*	*	*	*	*	*				*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*
inextricata		*	*	*	*	*	*				*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*
Idia															*							*		*				
bicolor				*							*	*	*		*							*		*				
tenebrosa				*							*	*	*		*							*		*				
discolor				*	*					*					*							*		*				
bivittata				*	*					*					*							*		*				
australis				*	*					*					*							*		*				
xanthogaster	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

	China.	India.	Philippines.	Malacca.	Borneo.	Singapore.	Gilolo.	Ternate.	Sumatra.	Java.	Waigou.	Bachian.	New Guinea.	Salwatty.	Celebes.	Ceram.	Amboyua.	Sula.	Gorrite.	Key.	Aru.	Kaisaa.	Mysol.	Solomon's Isles.	Australia.	Africa.	Ceylon.	Corea.
Idia																												
æqualis
divisa
prolata	.	.	*
testacea
Musca																												
defixa	*
infixa	*
fumipennis	*
dotata	*
diffidens	*
chrysoides	*
trita	*
reflectens	*
porphyrina	*
confixa	*
perfixa	*
affixa	*
chalybea	*
micans	.	*	.	.	.	*	.	.	*	*
exempta	*
prospera
costalis	*	.	.	.	*	.	.	.	*
gloriosa	*
opulenta
conflagrans
delectans
diffusa	*
decrescens
bivittata	*	.	.	.	*	*
sarcophagoides	*
mesembrinoides	*
ingens	*
macularis	*	*
divitiosa	.	.	*	*
marginifera	*	*	*	*
nitescens	*	.	.	*
ditissima	.	.	*	*	.	.	*
flaviceps	.	*	.	.	.	*	*	*	.	.	*
selecta	*	.	.	*
sperata	*	.	.	*
inscribens	*	.	.	*
electa	*	.	.	*
optata	*	.	.	*
obtrusa	*	*	.	.	*	*	*
benedicta	*	.	.	.	*	*
fortunata	.	.	*	*	.	.	*	*
porphyricola	*	*
intrahens	*	.	.	*
proferens	*	.	.	*
refixa	*	*	*	.	.	*
gavisa	*	.	.	*
inconclusa	*	.	.	*
obscurata	*	*	*

[illegible]

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	China.	India.	Philippines.	Malacca.	Borneo.	Singapore.	Gilolo.	Ternate.	Sumatra.	Java.	Waigiu.	Bachian.	New Guinea.	Salwatty.	Celebes.	Ceram.	Amboyna.	Sula.	Gorrie.	Key.	Aru.	Kaisa.	Mysol.	Solomon's Isles.	Australia.	Africa.	Ceylon.	Corea.
Lamprogaster																												
glabra					*	*																						
transversa				*																								
vittata				*																								
guttata						*	*																					
truncatula						*	*																					
basilutea						*	*																					
divisa					*	*	*																					
punctata					*	*	*																					
guttulosa					*	*	*																					
marginifera												*	*		*	*	*					*	*	*				
sexvittata												*	*		*	*	*					*	*	*				
luteipennis												*	*		*	*	*					*	*	*				
costalis												*	*		*	*	*					*	*	*				
superna							*															*	*	*				
quadrilinea																						*	*	*				
delectans																						*	*	*				
scutellaris																						*	*	*				
bispinosa													*	*		*	*					*	*	*				
ochromyoides													*	*		*	*					*	*	*				
celyphoides													*	*		*	*					*	*	*				
patula													*	*		*	*					*	*	*				
ventralis													*	*		*	*					*	*	*				
sepsoides													*	*		*	*					*	*	*				
tetyroides													*	*		*	*					*	*	*				
Zygænula																												
singularis															*													
paradoxa															*		*					*	*	*				
variipennis												*	*		*		*					*	*	*				
vittifinis												*	*		*		*					*	*	*				
Callantra																												
smicroides															*		*											
Aragara																												
crassipes															*		*											
Enicoptera																												
pictipennis															*		*											
tortuosa															*		*											
plagifera															*		*											
arcuosa															*		*											
rufiventris															*		*											
Dacus																												
æneus					*					*																		
determinatus					*																							
figuratus					*																							
divergens															*		*											
pubiseta												*	*		*		*						*	*				
addens												*	*		*		*											
devius											*	*	*		*		*											
strigifer							*																					
mutilloides															*		*					*	*	*				
furcifer							*								*		*											
expertus							*								*		*											
sepedonoides											*	*			*		*											
curvifer											*	*			*		*											

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Valonia																												
complicata				*																								
Brea																												
discalis													*	*														
contraria													*	*														
Adrama																												
selecta											*	*		*														
consors												*	*								*	*	*					
Diopsis																												
quadriguttata				*	*							*	*									*	*	*				
quinqueguttata				*	*																							
discrepans				*	*																							
subnotata			*		*										*	*												
detrahens															*	*						*	*	*				
Noeeta																												
latiuscula					*							*	*									*	*	*				
Urophora																												
fasciata					*																							
Trypeta																												
rudis					*																							
multistriga											*																	
retorta							*														*	*						
transiens																	*											
dorsigutta																						*	*					
approximans															*	*						*	*					
basalis															*	*						*	*					
amplipennis			*												*	*						*	*					
lativentris															*	*						*	*					
stellipennis															*	*						*	*					
impleta															*	*					*	*						
subocellifera															*	*					*	*						
roripennis															*	*				*	*							
basifascia															*	*					*	*						
nigrifascia															*	*					*	*						
signifacies															*	*					*	*						
melaleuca															*	*					*	*						
diversata															*	*					*	*						
brevivitta												*	*								*	*						
Ortalis																												
prompta											*	*									*	*						
obliqua											*	*									*	*						
tarsalis											*	*									*	*						
æquifera						*															*	*						
concisivitta						*															*	*						
complens																					*	*						
punctifascia						*															*	*						
leucomera															*	*					*	*						
vacillans															*	*					*	*						
decatomoides														*	*						*	*						
contigua												*	*		*	*					*	*						
semivitta												*	*		*	*					*	*						
Strumeta																												
conformis					*																*	*						
repleta											*			*							*	*						

	China.	India.	Philippines.	Malacca.	Borneo.	Singapore.	Gilolo.	Ternate.	Sumatra.	Java.	Waigou.	Bachian.	New Guinea.	Salwatty.	Celebes.	Ceram.	Amboyna.	Sula.	Gorrite.	Key.	Aru.	Kaisaa.	Mysol.	Solomon's Isles.	Australia.	Africa.	Ceylon.	Corea.
Lissa																												
cylindrica													*															
Nerius																												
fuscipennis			*		*	*				*					*													
duplicatus							*				*	*	*								*							
tibialis													*															
mantoides													*					*										
Cœnurgia																												
remipes															*							*						
Texara																												
compressa					*	*																						
dioctrioides															*													
Stymbara														*														
vagaria													*															
Seraca																												
signifera															*	*												
signata															*	*												
abbreviata													*		*	*												
Gobrya														*														
bacchoides															*	*												
Psila																												
bipunctifera															*	*												
munda															*	*												
calobatoides													*	*	*	*												
cruciata													*	*	*	*												
basalis													*	*	*	*												
vittifera													*	*	*	*												
Piophila																												
contecta															*	*												
disjuncta													*	*	*	*												
Opomyza																												
nigrifinis															*	*												
Milichia														*														
minuta													*															
Gymnopa																												
gutticosta					*																							
infusa					*																							
Oscinis																												
lineiplena															*	*						*						
noctilux															*	*						*						
femorata															*	*						*						
Chlorops																												
conclusata													*															
Cephaloconus																												
tenebrosus												*																
Drosophila																												
finigutta													*	*	*	*						*						
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imparata													*	*	*	*						*						
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rudis													*	*	*	*						*						
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lateralis													*	*	*	*						*						

	China.	India.	Philippines.	Malacca.	Borneo.	Singapore.	Gilolo.	Ternate.	Sumatra.	Java.	Waigiu.	Bachian.	New Guinea.	Salwatty.	Celebes.	Ceram.	Amboyana.	Sula.	Gorrite.	Key.	Aru.	Kaisaa.	Mysol.	Solomon's Isles.	Australia.	Africa.	Ceylon.	Corea.
Drosophila																												
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Nomba																												
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Ochthera																												
innotata															*	*												
Notiphila																												
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ortalioides														*														
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Phora																												
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parilis			*									*																
dubia															*													

Contributions to a Monograph of the *Aphroditacea*.

By WILLIAM BAIRD, M.D., F.L.S.

(Continued from vol. viii. p. 202.)

[Read Nov. 16, 1865.]

Family IV. ACOETIDÆ.

(Acoëtea, *Kinberg, Öfversigt Kongl. Vetenskaps-Akademiens Förhandlingar*, 1855, p. 386.)

Body elongate; no facial tubercle; tentacle short, arising from the middle of the anterior portion of cephalic lobe; bases of antennæ concealed under the peduncles of the eyes; eyes 2, peduncled; pharynx exsertile, papillose on anterior margin; jaws large, horny, armed with two central and many lateral teeth; palpi long, strong, and smooth. Elytra 39-93 pairs, placed upon the 2nd, 4th, 5th, 7th, and all alternate odd segments onwards to the extremity of the body; segments not bearing elytra provided with dorsal cirri.

Genus I. ACOETES.

Acoëtes, *Audouin & Edwards, Hist. Nat. du Littoral de la France*,
ii. p. 92.

Elytra flat, covering the whole back, and arranged imbricately from behind forwards, or in the reverse way to that of the *Aphroditidæ* and *Polynoïdæ*, the posterior portion of each elytron being covered by the anterior of the one behind it; peduncles of eyes about the same length as the peduncle of tentacle.

Sp. 1. ACOETES PLEEI, *Audouin & Edwards, l. c.* p. 101, pl. 2A. figs. 7-14.

Polyodontes Pleei, Grube, Archiv für Naturg. 1855, p. 90.

Hab. Martinique, West Indies, *M. Pleei*.

Sp. 2. ACOETES LUPINA, *Stimpson, Proceed. Boston Soc.* v. p. 116.

Hab. South Carolina, *Stimpson*.

Genus II. EUPOMPE, *Kinberg, l. c.* p. 386.

Cephalic lobe tripartite on anterior margin; peduncles of eyes a little shorter than peduncle of tentacle, and occupying the anterior portion of cephalic lobe; elytra 93 pairs, flat, thin, and inversely imbricated, or from behind forwards, leaving the anterior and middle portion of the back naked, but covering the posterior part.

Sp. 1. EUPOMPE GRUBEI, *Kinberg, l. c.* p. 387, and in *Fregatten Eugénies Resa*, p. 24, tab. 7. figs. 35A-35H, tab. 10. fig. 59.

Hab. Near Guayaquil, *Kinberg*.

Genus III. PANTHALIS, *Kinberg, l. c.* p. 386.

Cephalic lobe tripartite on anterior margin; central teeth of jaws contiguous; peduncles of eyes of the same length as that of tentacle, and occupying the anterior portion of cephalic lobe. Elytra 39 pairs; the anterior flat, covering the back, inversely imbricated; the remainder campanulate, imbricated posteriorly, and leaving the middle of the back uncovered.

Sp. 1. PANTHALIS OERSTEDI, *Kinberg, l. c.* p. 387, and in *Fregatten Eugenies Resa*, p. 25, tab. 6. figs. 34, 34A-34H, tab. 10. fig. 60.
Hab. West coast of Sweden, *Kinberg*.

Sp. 2. PANTHALIS GRACILIS, *Kinberg, Fregatten Eugenies Resa*, p. 26, tab. 10. fig. 61.
Hab. Near Rio Janeiro, *Kinberg*.

Genus IV. POLYODONTES.

(*Renieri*) *Blainville, art. Vers, Dict. Sc. Nat.* tom. lvii. p. 461.

Elytra very small, not covering the back, alternating with dorsal cirri; jaws large and horny; no antennæ; no tentacle; palpi long; eyes 2, peduncled.

Sp. 1. POLYODONTES MAXILLOSUS.

Phyllodoce maxillosa, Ranzani, Mem. Stor. Nat. Bologna, 1820, p. 1, tab. 1. figs. 2-9.

Hab. Adriatic Sea, *Ranzani*.

Sp. 2. POLYODONTES GULO, *Rüppell; Grube, Archiv für Naturg.* 1855, p. 90.

Hab. Red Sea, *Rüppell*.

Family V. SIGALIONIDÆ.

(*Sigalionina, Kinberg, l. c.* p. 387.)

Body long, narrow; no facial tubercle; cephalic lobe rounded. Feet, in anterior segments, provided with either an elytron or a dorsal cirrus; in posterior segments, feet provided with both elytra and dorsal cirri.

Genus I. SIGALION.

Sigalion, Audouin & Edwards, Hist. Nat. du Litt. de la France, ii. p. 3 (not *Kinberg*).

Sthenelais, Kinberg, l. c. p. 387.

Cephalic lobe rounded, having on its mesial portion, which is

indented, a strong tentacle, at the base of which are affixed the antennæ; eyes 2 or 4 (?), sometimes so indistinct as not to be easily seen. Setæ of feet of three kinds—setaceous and serrulate, subulate and serrulate, jointed and bidentate. Elytra covering the back, furnished with simple papillæ.

Kinberg, in taking the *Sigalion Mathildæ* of Audouin and Edwards as the type of his restricted genus *Sigalion*, was, unwittingly perhaps, led into an error, from that species having been originally described by these authors from an imperfect specimen, in which the tentacle was destroyed.

In the illustrations to the 'Règne Animal,' édition Crochard, M. Edwards rectifies this mistake, having, since the first publication of the species, met with other and more perfect specimens: in these the tentacle was present.

It is only right and fair, as Ehlers had already pointed out, to restore the name *Sigalion* to the typical species as correctly described and figured by M. Edwards in the 'Règne Animal.' I therefore propose to retain the name *Sigalion* for the species which Kinberg has placed in his genus *Sthenelais*, and to institute a new genus to receive such as he referred to his restricted genus *Sigalion*.

Sp. 1. *SIGALION MATHILDÆ*, Audouin & Edwards, *Hist. Nat. du Littoral de la France*, ii. p. 105, tab. 2. figs. 1–10; *Règne Animal*, éd. Crochard, tab. 20. figs. 1, 1a–1c.

Hab. Coast of France, Edwards.

Sp. 2. *SIGALION BOA*, Johnston, *Loudon's Mag. Nat. Hist.* vi. p. 322, fig. 42 (1833).

Sigalion Idunæ, Rathke, *Act. Nov. Acad. Nat. Cur.* xx. pt. 1. p. 150, tab. 9. figs. 1–8 (1843).

Hab. Coast of Britain, Johnston; Coast of Norway, Rathke (*Mus. Brit.*).

Sp. 3. *SIGALION HELENÆ*.

Sthenelais Helenæ, Kinberg, *l. c.* p. 387, and in *Fregatten Eugenies Resa*, p. 27, tab. 8. figs. 36, 36A–36H.

Hab. Valparaiso, Kinberg.

Sp. 4. *SIGALION ARTICULATUM*.

Sthenelais articulata, Kinberg, *l. c.* p. 387, and in *Fregatten Eugenies Resa*, p. 28, tab. 8. figs. 38, 38A–38H, tab. 10. fig. 62.

Hab. Rio de Janeiro, Kinberg.

Sp. 5. SIGALION BLANCHARDI.

Sthenelais Blanchardi, *Kinberg, Fregatten Eugenies Resa*, p. 28, tab. 8. figs. 37A-37H.

Hab. Valparaiso, *Kinberg*.

Sp. 6. SIGALION OCULATUM, *Peters, Monatsbericht Akad. Wissenschaft. Berlin*, 1854, p. 610; *Arch. für Naturg.* 1855, p. 38.

Sthenelais oculata, *Kinberg, Fregatten Eugenies Resa*, p. 29, tab. 8. figs. 39, 39B-39H.

Hab. Mossambique, *Peters*.

Sp. 7. SIGALION LÆVE.

Sthenelais lævis, *Kinberg, Fregatten Eugenies Resa*, p. 29, tab. 8. figs. 40, 40B-40G.

Hab. Island of Eimeo, Pacific, *Kinberg*.

Sp. 8. SIGALION LIMICOLA, *Ehlers, Borstenwürmer*, i. p. 120, tab. 4. figs. 4-7, tab. 5. figs. 1-10.

Hab. Quarnero, Adriatic, *Ehlers*.

Sp. 9. SIGALION ARCTUM?

Aphrodita arcta, *Dalyell, Powers of Creat.* ii. p. 170, tab. 24. fig. 14.

Hab. Coast of Scotland, *Dalyell*.

Sp. 10. ? SIGALION PERGAMENTACEUM, *Grube, Annulata Oerstediana*, p. 24.

Hab. Santa Cruz, West Indies, *Oersted*.

Grube refers this species, with doubt, to the genus *Sigalion*.

Sp. 11. SIGALION BLAINVILLII, *Costa, Ann. Sc. Nat.* 2nd series, xvi. p. 269, tab. 11. figs. 1, 1a-1d.

Hab. Gulf of Naples, *Costa*.

Genus II. THALENESSA.

Sigalion, *Kinberg*, non *Aud. & Edwards*.

Cephalic lobe broad anteriorly; no tentacle; antennæ two, very short, placed on the anterior margin of the cephalic lobe; eyes 2, distant; compound setæ bidentate; simple setæ serrate; elytra covering the back, with ramose fimbriæ on the margin.

Sp. 1. THALENESSA EDWARDSI.

Sigalion Edwardsi, *Kinberg, l. c.* p. 387, and in *Fregatt. Eugen. Resa*, p. 30, tab. 9. figs. 41, 41A-41H, t. 10. f. 63.

Hab. Sea off the mouth of the River Plate, South America, *Kinberg*.

Genus III. *LEANIRA*, *Kinberg*, *l. c.* p. 388.

Cephalic lobe rounded, receiving the tentacle in a mesial groove; no antennæ; palpi very long; eyes 2, placed near the tentacle; superior setæ closely serrulate; inferior setæ slender, compound, pectinato-canaliculate at the apex; anterior elytra not altogether covering the back; no papillæ.

Sp. 1. *LEANIRA* QUATREFAGESI, *Kinberg*, *l. c.* p. 388, and in *Fregatt. Eugen. Resa*, p. 30, tab. 9. figs. 42, 42 A-42 H, tab. 10. fig. 64.

Hab. Sea off the mouth of the River Plate, South America, *Kinberg*.

Sp. 2. *LEANIRA* STELLIFERA.

Nereis stellifera, *Müller*, *Zool. Dan.* tab. 62. figs. 1-3.

Sigalion stelliferum, *Sars*, *Förhand. Vidensk. Selsk. Christiania*, 1861, p. 51.

Sigalion tetragonum, *Oersted*, *Fortegnelse*, p. 7, tab. 2.

Hab. Coasts of Norway and Sweden, *Müller*, *Sars*, and *Oersted*.

Genus IV. *PSAMMOLYCE*, *Kinberg*, *l. c.* p. 388.

Cephalic lobe anteriorly produced, and forming the thick base of a long tentacle; antennæ none; eyes 4? (2?); superior setæ simple, very slender, serrate; inferior setæ strong, bidentate; elytra not covering the middle of the back, with long fimbriæ on their margin.

Sp. 1. *PSAMMOLYCE* HERMINIÆ.

Sigalion Herminia, *Aud. & Edw. Littoral de la France*, ii. p. 107, tab. 1 A. figs. 1-6.

Hab. Rochelle, *M. d'Orbigny*.

Sp. 2. *PSAMMOLYCE* PETERSI, *Kinberg*, *l. c.* p. 388, and in *Fregatt.*

Eugen. Resa, p. 31, tab. 9. figs. 43, 43 A-43 H.

Hab. Mossambique, *G. v. Düben*.

Sp. 3. *PSAMMOLYCE* FLAVA, *Kinberg*, *l. c.* p. 388, and in *Fregatt.*

Eugen. Resa, p. 31, tab. 9. figs. 44, 44 A-44 H.

Hab. Rio Janeiro, *Kinberg*.

Genus V. *CONCONIA*, *Schmarda*, *Neue wirbell. Thiere*, ii. p. 150.

Segments of body numerous; elytra on 2nd, 4th, 5th, 7th, and all alternate segments up to the 27th, and then on every succeeding segment to the end of the body; dorsal cirri on all the segments. Feet biramous; setæ of upper branch denticulate;

those of inferior branch of two kinds: 1st, simple and strobili-form; 2nd, compound and bidentate. Jaws 4.

Sp. 1. CONCONIA CÆRULEA, *Schmarda, l. c.* tab. 37. fig. 319.

Hab. Coast of Chili, *Schmarda*.

Family VI. PHOLOIDIDÆ.

(Pholoidea, *Kinberg, Fregatt. Eugen. Resa*, p. 1.)

Elytra on all the alternate segments; no dorsal cirri, either on the segments possessing elytra, or on those in which elytra are wanting.

Genus I. PHOLOË, *Johnston, Ann. Nat. Hist.* ii. 428.

Body linear, oblong; proboscis with four horny jaws, the orifice plain; eyes 2; branches of feet connate; bristles of superior branch capillary, those of inferior branch falcate.

Sp. 1. PHOLOË INORNATA, *Johnston, Ann. Nat. Hist.* ii. p. 437, tab. 23. figs. 1-5.

Hab. Cumbrae, Firth of Clyde, *D. Robertson*; Berwick Bay, *Johnston (Mus. Brit.)*.

Sp. 2. PHOLOË EXIMIA, *Dyster, MS.* in *Johnston's Catalogue of Non-parasitic Worms in British Museum Collection*, p. 122.

Hab. Tenby, *Dyster*.

Sp. 3. PHOLOË BALTICA, *Oersted, Conspect. Annul. Dan.* fascic. i. p. 14, tab. 1. fig. 21, tab. 2. figs. 34-36, 40.

Hab. Coast of Denmark, *Oersted*.

Sp. 4. ? PHOLOË MINUTA, *Oersted, Grænl. Ann. Dorsib.* p. 17, tab. 1. figs. 3, 4, 8, 9, 16.

Aphrodita minuta, Fabricius, Faun. Grænl. p. 314.

Hab. Godthaab, coast of Greenland, *Oersted*.

Sp. 5. PHOLOË TECTA, *Stimpson, Invertebrata of Grand Manan*, p. 36.

Hab. Grand Manan, in 4 forms, *Stimpson*.

Genus II. GASTROLEPIDIA, *Schmarda, Neue wirbell. Th.* ii. p. 158.

Elytra and dorsal cirri on alternate segments; elytra on 2nd, 4th, 5th, 7th, and all alternate segments up to the 53rd; ventral surface covered on all the segments with elytriform lamellæ; feet biramous.

Sp. 1. GASTROLEPIDIA CLAVIGERA, *Schmarda*, l. c. p. 159, tab. 37. fig. 315.

Hab. Ceylon, *Schmarda*.

Family VII. PALMYRIDÆ.

(Palmyracea, *Kinberg*, *Fregatt. Eugen. Resa*, p. 1.)

No elytra; fans of flat bristles on all the segments; segments having cirri and tubercles alternately along the back.

Genus I. PALMYRA, *Savigny*, *Système des Annélides*, p. 16.

Body oblong, depressed; proboscis without tentacles on edge; jaws semicartilaginous; eyes 2; feet with branches separate.

Sp. 1. PALMYRA AURIFERA, *Savigny*, l. c. p. 17.

Hab. Isle of France, *Ouvier*; Red Sea, *Savigny*.

Sp. 2. PALMYRA ELONGATA, *Grube*, *Annulat. Oersted.* p. 25.

Hab. Santa Cruz, West Indies, *Oersted*.

Sp. 3. PALMYRA DEBILIS, *Grube*, *Archiv für Naturg.* 1855, p. 90.

Hab. Villa Franca, Mediterranean, *Grube*.

Since this paper on the Aphroditacea was commenced (see vol. viii. of this Journal, p. 172) I have, through the kindness of M. Malmgren, now of Helsingfors, been made acquainted with an excellent paper of his on the Annelides of the North Sea, "Nordiska Hafs-Annulater," published in the 'Öfversigt af K. Vet. Akad. Förhandlingar' for 1865. I regret not having seen this paper before these "Contributions to a Monograph of the Aphroditacea" were first commenced in this Journal. In his paper M. Malmgren has instituted no fewer than ten new genera belonging to the family Polynoidæ. Of these I can only here mention the names, with a reference to the species enumerated in my "Contributions."

I. NYCHIA. To this genus he refers nos. 2 & 3 of the genus *Harmothoe*, pp. 194, 195, *H. assimilis* and *H. scabra*. These two species he regards as only one, and as being synonymous with the *Aphrodita cirrosa* of Pallas.

II. EUNOË. To this genus he refers the *Lepidonota scabra* of Oersted, which, upon very good grounds, he considers distinct from the *Aphrodita scabra* of Fabricius.

III. LAGISCA. To this genus he refers no. 11 of the genus *Harmothoe*, p. 195, the *Polynoë rarispina* of Sars.

IV. EVARNE. To this genus he refers no. 3 of the genus *Antinoë*, p. 192, the *Polynoë impar* of Johnson.

V. LANILLA. To this genus he refers no. 1 of the genus *Antinoë*, p. 192, the *Polynoë lævis* of MM. Audouin & Edwards.

VI. MELÆNIS, and VII. EUCRANTIA. Of these two genera no species had been described previously.

VIII. ALENTIA. To this genus Malmgren refers no 9 of the genus *Halosydna*, p. 187, the *Polynoë gelatinosa* of Sars.

IX. ENIPO, and X. NEMIDIA. These genera approach the restricted genus *Polynoë*; but no species had previously been described.

Some Account of a newly discovered British Fish of the Family *Gadidæ* and the genus *Couchia*. By JONATHAN COUCH, F.L.S., &c.

[Read Nov. 16, 1865.]

THE genus *Couchia* was formed by Mr. W. Thompson, and has been adopted by Dr. Günther, as separated from that of *Motella* or the Rocklings by the more moderately lengthened body of the species, which is also compressed, and by the silvery and brilliant appearance of the sides. In fact, in their general proportions the fishes of this genus are as different from the Rocklings as, among their kindred the other *Gadidæ*, the Pollack and Whiting are from the Ling; while their manners also, so far as they are known, are as different as their shape. And yet, in some of the more prominent particulars of their organization, there exists a similarity between the *Motellæ* and *Couchiæ*, which is the more remarkable as it consists of a relative gradation in the species of each, which is only to be traced throughout by the discovery of one, of which a notice is now presented to the Linnean Society.

As there is a species of *Motella* which is characterized by the presence of four prominent barbs placed in pairs on the front of the head, with a barb dependent also from the lower jaw, so we find in the best-known, and probably most widely spread, of the genus *Couchia*, the Mackerel Midge (*C. glauca*), a similar conformation, together with a characteristic ciliated membrane situated in a chink in advance of the dorsal fin; which membrane certainly is not itself a fin, but an organ of sensibility which is in its most lively motion when the proper fins are at rest. But long before

the discovery of this fish as a separate species, an account had been given by Colonel Montagu of a kindred fish, which he supposed to be common to the coast of Devonshire, and which he described as being distinguished by the possession of a pair only of these frontal barbs; and yet for more than half a century this species of Montagu had remained in obscurity, until it was again brought to light by the diligent and acute observation of Mr. Thomas Edward of Banff, who found it in some abundance in the Moray Firth, and kindly supplied the writer with examples, which enabled him to give an account of it, with a figure, in the concluding portion of the fourth volume of his 'History of the Fishes of the British Islands.' The five-bearded species had been already represented in a coloured figure in the third volume of the same book, as also in Mr. Yarrell's well-known volumes. But a vacancy still existed in the analogy between the species of the nearly allied genera *Motella* and *Couchia*; and it is this, again, we are able to supply through the persevering diligence of Mr. Edward, whose intelligence enabled him to detect the existence of another species, and whose kindness has, with an example, communicated materials which enable the writer to produce, with a satisfactory likeness, a somewhat extended notice of its actions, the latter of which will be described, as far as can be, in this attentive observer's own words. The length of the example from which my notes were taken is an inch and five-eighths; and as half a dozen others were about the same size, it may be judged to be their usual magnitude, as it does not differ much also from that of *C. glauca* and *C. Montagu*. Compared with the latter, its shape is more slender, the pectoral fin rather more lengthened and pointed, the ventral fins longer and slender, the cilia on the back, along the edge of the membrane, more extended, apparently more numerous, and very fine; barb on the lower jaw long; but what especially marks this little fish as distinct from the other species is, that, besides the pair of barbs in front of the head, there is a single one of much larger size in front of the upper lip, and which points directly forward with a slight inclination downward, thus analogically answering to the middle barb that projects from the snout of the four-bearded Rockling (*Motella cimbria*). It is probable that there are teeth in the jaws; but they can scarcely be seen; and there is a row of pores along each border of the superior maxillary bone. Some further particulars of this fish I prefer to give in the words of its discoverer, who describes its colour as a beautiful deep green along the back when caught, the sides brilliantly white; but

when it reached me, preserved in spirit, it was blue, with a tinge of the same along the lateral line. In some examples in Mr. Edward's possession the colour on the back was a faint yellow, with a narrow stripe of bluish purple on the side, and in all of them the silvery hue of the lower portions of the body is found to rise nearer the back than in the other species of this genus. The back also and head were thickly covered with very small, dark, star-like spots, which, together with two narrow yellow streaks extending from the top of the head, above the mouth, and diverging to the eyes, had disappeared when subjected to my examination. Iris of the eye silvery, the pupil bluish green; the fins dull grey, as also the pair of barbs; but the single one on the lip at its root is almost of as deep a colour as the top of the head and back.



Five examples of these little fishes were kept alive by Mr. Edward for a week; and during that time he describes their action as being lively and singular, although perhaps not generally so active as the Mackerel Midge (*C. glauca*), and in general they appeared to prefer to remain near the bottom rather than to swim aloft. When at liberty their habit is to keep in small companies; but they seem to treat other fishes as enemies, and even their own companions are occasionally subject to their hostility, as is shown in the following instances related by Mr. Edward. He placed a Goby, he does not say of what species, in the same vessel with these fishes; but in the space of twenty minutes his attention was drawn to a commotion among them, which arose from the persecution inflicted on the unfortunate stranger, which they were violently assailing with their heads, while it endeavoured to escape from their fury. After a considerable time, however, this eager violence proved a misfortune to one of the Midges; for, missing its mark as it rushed forward, its head was dashed against the side of its glass prison with such force as to cause it to sink motionless to the bottom, and, although at times it appeared to struggle against its fate, in about an hour it was dead; as was the Goby in a few minutes after. Nor did this pugnacious disposition cease when the apparent cause of it had ceased to live; for, although they seemed peaceably disposed when first placed in the vessel, they now began to attack each other vigorously, as also

their dead companion at the bottom; and if this fury subsided for a time, it was repeatedly renewed without apparent cause, and with an activity which caused them sometimes to leap out of the water, and even over the side of the vessel, to a considerable distance. Mr. Edward surmises that in the open sea this propensity to leap above the surface is rarely exercised; but it renders it difficult to keep them alive within a narrow space, and in the present instance it became necessary to place a (glass) cover on the vessel in which they were confined—an arrangement which speedily caused the death of two of the remaining combatants, in consequence of the injury they received from leaping against it in the violence of their contention. Mr. Edward remarks that he never witnessed the lifting up of the longer filament in front of the ciliated membrane on the back, but only of such as were behind it. The latter, however, were kept in constant vibratile action when the proper fins were at rest (as is the case also with this membrane in the Rocklings), while on the slightest disturbance their motion ceased and they sank within the protection of the channel prepared to receive them. The single barb in front of the upper lip appears to be endued with some special function, since, unlike the others, it is capable of visible, and perhaps voluntary, extension and retraction.

I regard it as no other than an act of justice to the discoverer of this fish to assign to it the name of Edward's Midge (*Couchia Edwardii*), of which the specific character is sufficiently obvious.

Some Observations on British *Salpæ*. By W. C. McINTOSH,
M.D., F.L.S.

[PLATE I.]

[Read Nov. 16, 1865.]

THE comparative rarity of these swimming Molluscoids within the ordinary experience of British zoologists induced me to pay some attention to them when lately engaged with another department of the science in the Hebrides. Indeed during the month of August they were the grand feature of the Western Ocean; so that the late Professor E. Forbes, in his three voyages through Scottish seas, during which he states that he saw not a single specimen *, must have passed these islands at the wrong season,

* And Gossé observes, in his 'Manual of Marine Zoology,' vol. ii., "They are chiefly tropical and oceanic animals, swimmers in the wide and open sea, visiting our coast so rarely that we can scarcely reckon them as properly British animals."

or kept too far from shore. Dr. McCulloch, the discoverer of the species described in the 'British Mollusca,' mentions that he found them from the middle to the latter end of August, and always linked together. They occurred lately from the beginning to the end of August; and probably the time of their appearance stretches into the end of July and the beginning of September*. They appear to have a wide distribution on the shores of the Western Islands and the regions bordering on the Minch, northwards and southwards.

At the beginning of August *Salpa runcinata* was the only species met with on the eastern shores of North Uist. The wind was westerly, and the weather good. In the creeks of Lochmaddy the hand-net could scarcely be put in without bringing some individuals of the solitary or aggregate forms to land (figs. 1 to 4). At this time few chains or portions of chains were met with along the beach-line, though the sea was calm. The separation of the aggregate forms must therefore have been due to changes in the individuals themselves or to previous rough weather. These individuals kept a foot or more under the surface of the water, and swam with vigour, showing none of the signs of impaired vitality that might warrant the statement that they soon perish after separation†.

In the loch itself on a quiet evening this species swarmed, moving in longer or shorter chains a few feet from the surface. Some of the chains had only a very slight bend; others were curved at one end like a crook; while a third series almost formed a U. There was no coiling or uncoiling of the chains, so far as I saw; but they moved slowly and steadily along, each appearing like a milky, semitranslucent, gelatinous riband marked with a series of dots. The most common hue of the visceral speck is brownish orange, though in some of the smaller individuals it is slightly yellow. Many solitary animals were also caught, and in confinement they proved somewhat hardier than the individuals of the aggregate form. Dr. McCulloch observes of this species, "that, like the Medusæ and analogous tribes, it cannot bear to be confined in a limited portion of water, as it died, even in the ship's bucket, in less than half an hour—a very remarkable circumstance in the economy of these imperfect animals." No difficulty, however, was encountered in this case in keeping Salpæ of all the forms

* Dr. Fleming got *S. runcinata* in spring on the coast of Caithness.

† *Vide* Rymer Jones's 'Animal Kingdom,' *Salpæ*.

alive for several days, provided the vessel was clean, wide at the top, and the sea-water frequently renovated.

No large Medusæ occurred in the bay at this date, the only other oceanic swimmers being hosts of a little *Sarsia* and a *Thaumantias*, that were caught in the creeks.

The Salpæ seem to be very sensitive in regard to the weather, as indeed the fragility of their chains might indicate. None appeared for about a week of rough or rainy weather, even though the surface of the sea might be as smooth as glass but for the pattering of the rain-drops. On a somewhat rough day the dredge near the mouth of the loch brought up in its progress hosts of the little *Thaumantias* previously mentioned, but not a single *Salpa*; so that they must have entirely evacuated the bay. Towards the eighth day a few isolated individuals were met with, not in the best condition; those amongst the rocks were mostly withered ones floated off the blades of *Fuci* between tide-marks. About a fortnight afterwards many of the same species (*S. runcinata*) were got near the mouth of the bay; but, curiously enough, all were brought in by the dredge, not a single specimen being captured by the towing-net, although the sea was moderately calm. Two other forms, however, were abundant on the surface, viz. *Salpa spinosa* of Otto (figured and described by Sars*, and mentioned by Forbes and Hanley in their work) and its progeny in chains (figs. 5 to 9). None but battered specimens of *S. runcinata* appeared at this time near the shore.

The enormous numbers of the two forms of *S. spinosa* that were driven into the creeks next day by the easterly breeze were surprising, and showed the extraordinary fecundity of the genus. The hand could not be held amongst the mild sea-water that laved the littoral *Fuci* without coming into contact with chains of the one form and individuals of both, that every wave of the sea poured in to be destroyed. After the breeze moderated, the *Fuci* between tide-marks sparkled in all directions with the quivering bodies of the unfortunate Salpæ, that, besides, here and there lay in heaps where the ebbing tide had stranded them behind stones. The hand net was filled by a solid mass when plunged into the water, and only a few specimens of *S. runcinata* were found amongst them.

* 'Fauna littoralis Norvegiæ,' part i. p. 79, tab. 10. This work did not come into my hands before the present paper had left them. The differences in the figures and descriptions will explain themselves; they are chiefly confined to the former.

So plentiful were the beached Salpæ that the Fuci were rendered doubly slippery, and the tangled masses of *F. serratus* hung down from the rocks their every crevice spangled with the glittering mollusks. The small fishes (Coalfishes, Fifteen-spined Sticklebacks, Gobies, and young Wrasses) were in unusual numbers at the sea-border, hunting about in shoals, and doubtless feasting luxuriantly on the autumnal repast so plentifully cast in their way. Nor were other marine animals behind in this respect: one Caryophyllia that hung from a stone at the verge of low water attracted notice by having its disk unusually expanded and translucent, hard to the touch, and not contracting by the latter stimulus or exposure to the air; the cause of all this was found to be the presence of at least eight of the unfortunate Salpæ in its stomach, some of them still free from serious injury. Salpæ do not occur in such profusion at all seasons, and the change of diet is doubtless agreeable to the marine inhabitants of these shores.

The climax of Salpa life, however, was reached on the 22nd of August, when the sea was unusually calm and the weather very fine. The shores of the creeks and bays were so heaped with the bodies of the two forms of *S. spinosa* that the Fuci and rocks appeared as if coated with masses of boiled sago; the water of the creeks resembled starch from the myriad swarms; and the Laminarian blades at low-water mark lay on a semisolid medium. There were vast multitudes, certainly, on and near the beach; but a sail in the bay demonstrated a still more wonderful extent of Salpa prolificness. It may be safely said that there was not a single square foot of Lochmaddy that did not contain Salpæ, and in some parts the sea resembled boiled sago for long distances. On the surface floated the two smaller forms of *S. spinosa*, the aggregate, as usual, predominating over the solitary ones; while from a few feet under the latter, as far down as the eye could reach, chains of all lengths and sizes of *S. runcinata* swam with the current in the quiet manner previously described. These milky bands crossed and recrossed each other to such an extent that the very character of the sea, I may say, was altered; and it seemed as if flocculent strings of some milky precipitate hung therein, or as if gigantic fibres of asbestos had been scattered in profusion and at random throughout the entire bay. The scene was equally novel and interesting. With every stroke of the oars the purple and two-horned forms (*S. spinosa*) rose from the water and rolled like glassy crystals from the blades, and chains of the former now and then clung till a reimmersion washed them off.

The very progress of the boat appeared to be impeded; and on looking along the still expanse of the sea, their quivering bodies roughened its surface like a myriad tremors on molten glass.

Towards the mouth of the bay, drifted masses of Fuci formed long transverse lines across the surface, and at these parts not only were the Salpa-masses increased in density, but a number of other swimming jellies of a different subkingdom accompanied them, such as *Pelagia cyanella*, *Æquorea*, *Oceania*, *Beroë*, and *Diphyes*, the cavities of the two former containing many Salpæ. Some small fishes also skimmed the surface, apparently feeding on the latter; and with the hand net young Sand-launces, Brills, and numerous Mackerel Midges (*Motella* (*Couchia*) *glauca*) were captured. In such circumstances there was no need of a towing-net; and indeed it was practically useless, becoming filled in a few seconds with a solid mass of the surface forms. Numerous gulls and guillemots that had been at work at these seaweed lines amongst the Salpa-hordes, or seizing the small fishes so engaged, took wing on the approach of the boat. The Salpæ extended outwards into the Minch in almost as great numbers. The sea was so calm that the Dunvegan packet had to be towed by its own boat from Skye to Lochmaddy—not a very common occurrence in these wild waters.

At this time not a scrap of a Salpa or a Medusa was found at the western side of the island; so that the Salpæ must have passed through the Sound of Harris with the westerly winds in the beginning of August, or else were originally resident in the Minch, and had been driven westwards by the easterly gales.

The chains of *Salpa runcinata* in sight varied from two and a half yards downwards; and the deeper ones may have been longer. Those near the surface were generally less than a yard long. As before mentioned, there was neither coiling nor uncoiling, nor the "regular serpentine movements" described in the various text-books; but the bands moved slowly through the water, seldom altering their curves to any appreciable extent. They varied in bulk according to the size of the component individuals. The mode in which they were attached to each other in these chains was not so easily made out as at first sight might appear; they separated into pieces when lifted from the water either with hand or net; and there is thus good excuse for the rude outline of Dr. McCulloch—an outline, however, that will at once be recognized by any one who has seen them in their native haunts. The figure by the late Professor E. Forbes*,

* Brit. Mollusca, vol. i. pl. E. fig. 6.

showing two in apposition, is stiff and artificial—a state in which it would never have been represented if he had seen living specimens.

The individuals adhere to each other by a considerable extent of their edges, including the attenuated extremities, and form a sort of interrupted double row by being alternately attached. Thus, for instance, the second is attached to the first on its *right side*, the point of its attenuated process reaching beyond the visceral speck. The third adheres to the *left side* of the second, its point also proceeding beyond the nucleus. The long axis of each is nearly parallel to that of the entire chain. Dr. McCulloch states that “each individual adheres to the preceding by a regular sequence of superposition lengthwise, so that the whole form a long simple chain.” He must have viewed the riband laterally.

Sometimes two individuals of large size (each 3 inches long) swam together—the fragment of a chain; and numerous single ones of the aggregate as well as of the solitary form occurred. The proper sphere of this species seemed to be from a point some feet below the surface, downwards, since any met with at the surface were mutilated, dying, or dead. One individual of the aggregate form was caught, just beyond the rocks, with a young specimen (true embryo of Professor Huxley) in its interior (fig. 1). The embryo, *a*, adheres to the nucleus, *b*, of the parent by the posterior extremity, and thus its anterior orifice agrees with that of the adult—a situation affording every facility for the passage of constantly renewed currents of water through its cavity. The adult specimen in this case exhibits a very common anastomosis of the muscular bands. In life these bands are scarcely seen, except as slight wrinkles during contraction; it is the immersion into strong spirit that renders them so visible.

The youngest condition of the solitary form observed is probably represented by that in the interior of fig. 1; the next, in the free form shown in fig. 4, where the preponderance of the visceral over the locomotive apparatus is very apparent. This is exactly the reverse of what takes place in the Ascidians, whose young forms acquire the maximum locomotive, the adult the maximum visceral. Each has its various requirements amply supplied in the structures developed at the time. The rounded opaque body *a*, fig. 4, would seem to be embryonic, since it diminishes progressively as the size of the animal increases, and in the adult disappears. In fig. 2 a developing chain is observed at *f*. A peculiar network of vessels occurs over a limited space in two of the solitary forms figured (*b*, figs. 2 and 3).

The solitary form of *S. spinosa* is very transparent, and during life its six circular muscular bundles are also only seen as faint lines during contraction. In addition to the characteristic posterior spines, there is a stout bifid spinous process (*g*, figs 5 & 6) and a small lateral spine on each side of the coiled chain. A small red ocellus is seen at *a*, fig. 5, and four opaque dots at *b*. The branchiæ, endostyle, nucleus, and coiled chain with various grades of developing young are represented in the figures. After preservation in spirit the inner tunic is seen to end, in each of the long posterior spines, in a trumpet-shaped process. This appearance is also observed in figs. 7 and 8, which represent a front and lateral view of a small and very active individual captured with the towing-net. It is probably a developing specimen of this form, judging from the number of muscular bundles and the trumpet-shaped ending of the tunic in the posterior processes. The latter, however, are flattened, oar-shaped, and short. It also possessed the bifid spinous process, at *b*, fig. 7. The nucleus was of a dull white hue in life; and the embryonic body, *a*, was still present. In one case the adult solitary form of this species was dead, as likewise were the included young; but the individuals (measuring $\frac{1}{10}$ th of an inch long) of the pigmy chain depending from the parent contracted vigorously. Each was furnished with a little red ocellus.

The individuals of the aggregate form of *S. spinosa* were of all sizes, from $\frac{3}{4}$ of an inch in diameter downwards. Their figure was somewhat pyriform and facetted (fig. 9). The nucleus is tinted of a fine bluish purple with a streak of yellow, and the branchial apparatus has also the former hue. At the anterior end of the nucleus a constant ciliary motion was seen under the lens, not connected with the efferent current issuing at the posterior aperture. When adhering together in chains, they swim with the bluish-purple nucleus downwards; and the same remarks apply to their mode of locomotion as to the ribands of *S. runcinata*. The chains of the former were in general much shorter than those of the latter, though broader in proportion, since they were composed of a double row with the individuals arranged alternately; that is, the transverse fissures of the one row were opposite the centres of the other.

When swimming in a vessel during the day, the contractions of *Salpa spinosa* and its aberrant form caused a lens-like condensation of the rays of light, which flashed on the glass beneath them on each occasion. *S. runcinata* was not observed to be lu-

minous in the twilight in the sea, neither were the two forms of *S. spinosa*; but when the latter were enclosed in a bottle, bright-greenish phosphorescent sparks were emitted on jarring the vessel in the dark; this, however, may have been due to the presence of other minute oceanic forms. There was no luminous appearance when the vessel was left quiescent in the dark; and none of the forms of either species were observed to give out the bright-greenish phosphorescence that invariably gilded the luminous Medusæ and Annelids for a few seconds after immersion in spirit.

A curious appearance was caused on the beach, during the plenitude of Salpa life, by the occurrence of two days of fine weather. The dried bodies of the beached Salpæ left whitish, glistening, scale-like patches on the black gneiss-stones and bare rocks near high-water mark; and when the chains of *S. spinosa* happened to subside without separation, an appearance was produced like the frond of *Asplenium viride* or *Trichomanes*, or the fossil imprint of some primeval fern.

DESCRIPTION OF PLATE I.

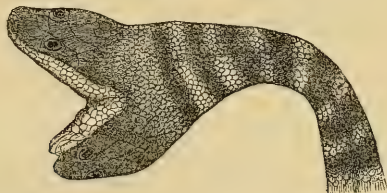
[Figs. 1, 2, 3, 6, 7 and 8 are from carefully made spirit preparations.]

- Fig. 1. *Salpa runcinata*, with young solitary form (true embryo of Huxley) in its interior. Enlarged. *a*, the embryo; *b*, the nucleus of the adult; *c*, the branchiæ; *d*, the endostyle.
- Fig. 2. An adult solitary form of the same species, about the natural size. *a*, nucleus; *b*, peculiar network of vessels; *c*, branchiæ; *f*, developing chain of young; *h*, endostyle.
- Fig. 3. A lateral view of another, smaller solitary form, showing the embryonic body at *a*, and the network of vessels at *b*. Enlarged.
- Fig. 4. A very young solitary form of *S. runcinata*. *a*, large embryonic body; *b*, nucleus; *c*, intestine. The muscular bands, branchiæ, and endostyle are apparent.
- Fig. 5. *Salpa spinosa*, enlarged, from a living specimen. *a*, ocellus; *b*, four minute opaque dots; *c*, branchiæ; *d*, nucleus; *e*, inner tunic with its muscular bands; *f*, coiled chain of young; *g*, bifid spinous process; *h*, endostyle.
- Fig. 6. A lateral view of one of the same species, enlarged.
- Fig. 7. Young solitary form of *Salpa spinosa* (?), enlarged. *a*, embryonic body; *b*, bifid spinous process; *c*, trumpet-shaped ending of inner tunic (mantle) in the posterior spine; *d*, nucleus.
- Fig. 8. A lateral view of the same specimen. The letters are similarly placed.
- Fig. 9. The aggregate form of *S. spinosa*, enlarged, from a somewhat contracted living specimen. *a*, bluish-purple nucleus; *c*, branchiæ; *h*, endostyle.

Notice of a Double-headed Water-Snake. By JOHN SHORTT, M.D., F.L.S., M.R.C.P.L., &c., General Superintendent of Vaccination, Madras.

[Read March 15, 1866.]

THE accompanying woodcut represents a specimen of a water-snake caught alive in the backwater on the Eastern Coast.



I had frequently heard the natives give accounts of many-headed snakes, but, from my knowledge of the country and the reptiles of the district, I regarded them as fabulous tales, till I was presented with the specimen from which the drawing was made.

The reptile belongs to the suborder *Colubrinæ*, family *Hydrophidæ*, and is most probably a young *Hydrophis sublaevis* of Gray. It measures $12\frac{1}{2}$ inches in length, and 7 lines below the union of the double neck, and $1\frac{1}{8}$ inch at the thickest part of its body, in circumference. The heads are distinct, and forked at the union, which in the integuments seems to occur at the base of the skull, whilst the separate necks unite about an inch lower down. The eyes, nostrils, mouth, and teeth in each head are perfect, and the two mouths lead into, or terminate in, one œsophagus, below the union, passing on apparently to the abdomen.

Crown shielded; occipital shields large; nostrils surrounded by a continuous ring; pupils round; body covered with small scales; ventral shields small; body fusiform; tail compressed and sword-shaped. Head dark brown, approaching black; concolorous interrupted stripes $\frac{1}{8}$ inch wide along the back; sides and belly yellowish white; tail ringed, black, and the extremity, to the extent of an inch, of the same dark colour around its circumference. The specimen was taken alive, and apparently in excellent health, by a native fisherman; and, from its perfection as regards its heads, it would have been interesting to know whether it fed with both its mouths. Should I be so fortunate as to succeed in procuring a second specimen, I shall be glad to re-

port the same to the Society. I hope to send the original to the museum of the Royal College of Surgeons, London, where it may be seen by any of the Fellows curious on the subject*.

A List of the Diurnal Lepidoptera recently collected by Mr. WHITELEY in Hakodadi (North Japan). By ARTHUR G. BUTLER, F.Z.S., Assistant, Zoological Department, British Museum. Communicated by WILLIAM CARRUTHERS, Esq., F.L.S.

[Read April 19, 1866.]

PAPILIO, *Linnaeus*.

1. PAPILIO BIANOR, *Cramer*, sp., var. *Japonica* †.

Papilio Bianor, *Cramer*, *Pap. Exot.* t. 103. f. c. (1776); *Fabricius*, *Ent. Syst.* iii. i. p. 1. n. 2.

Achillides Bianor, *Hübner*, *Verz. bek. Schmett.* 85 (1816).

♀ Papilio Paris, *Godart*, *Enc. M.* ix. 67. n. 116 (1819).

North India, China.

2. PAPILIO MACHAON, *Linnaeus*, sp., var. (Eastern form).

Papilio Machaon, *Linnaeus*, *Syst. Nat.* ii. 950, n. 33 (1767); *Hübner*, *Europ. Schmett. Pap.* f. 390, 391 (1806-27).

Papilio Jasoniades, Machaon, *Hübner*, *Verz. bek. Schmett.* 83 (1816).

Amaryssus, Machaon, *Dalm. Kong. Vet. Acad. Holm.* xxxvii. 85 (1816).

Papilio Sphyrus, *Hübner*, *Europ. Schmett. Pap.* f. 776, 777 (1823?).

Europe, India, Japan, North China.

PARNASSIUS, *Latreille*.

3. PARNASSIUS GLACIALIS, sp. n.

Alæ supra subhyalinæ, albæ, venis nigris: *anticæ* apice hyalino; cella media fasciata fasciaque brevi terminata, fasciis cinereis: *posticæ* margine abdominali late nigro: *corpus* nigrum, thorace præ ferrugineo; abdomine cinereo pilosato, a latere ferrugineo; antennæ nigræ.

Alæ subtus nitentes: *posticæ* margine abdominali cinereo; aliter velut supra: *corpus* nigrum, pilis ferrugineis sparsum.

Alar. exp. unc. $2\frac{6}{8}$ — $2\frac{13}{16}$.

This beautiful species is most closely allied to *P. Mnemosyne*, *Latreille* (South Europe). It differs from it in its greater size,

* The specimen is now in the Museum of the Royal College of Surgeons, which was already in possession of a similar monstrosity, apparently in the same species of Snake.

† Alæ *anticæ* subtus latè fuscæ: *posticæ* caudis vix spathatis; supra macula anali minus conspicua; subtus prope marginem luteo rorata, maculis submarginalibus minus lunulatis, macula anali his haud distinguenda.

P. Mnemosyne measuring from $2\frac{3}{8}$ to $2\frac{5}{8}$ inches; also in having grey bands instead of black spots in the front-wing cell, the whole of the wings, instead of only the apical area, being semitransparent; no discal spot in the hind wings, as usually the case with *P. Mnemosyne*; a much broader extent of black at the abdominal margin, and the ferruginous hairs of the body much more vivid.

LEUCOPHASIA, *Stephens*.

4. LEUCOPHASIA SINAPIS, *Linnaeus*, sp., var. (costa anticarum elongata).

Papilio Sinapis, *Linnaeus*, *Syst. Nat.* ii. 760. n. 79 (1767); *Hübner*, *Europ. Schmett. Pap.* f. 410, 11 (1806-27).

* *Leucophasia Sinapis*, *Stephens*, *Ill. Haust.* i. 24 (1827).

Leptosia Lathyri, *Hübner*, *Verz. bek. Schmett.* 95 (1816).

Leptosia candida, *Westwood* in *Humphr. Brit. Butterf.* 31 (1840).

Europe, Syria.

Note. The Japanese form of this insect differs from the European one in having the front wings three-sixteenths longer in proportion to their breadth at the widest part; the apical patch is also only marked by the nervures.

PIERIS, *Boisduval*.

5. PIERIS CRATÆGI, *Linnaeus*, sp.

Papilio Cratægi, *Linnaeus*, *Syst. Nat.* ii. 758. n. 72 (1757); *Hübner*, *Europ. Schmett. Pap.* f. 339, 340 (1806-27).

Aporia Cratægi, *Hübner*, *Verz. bek. Schmett.* 90 (1816).

Pieris Cratægi, *Godart*, *Enc. M.* ix. 154. n. 127 (1819).

Pontia Cratægi, *Donzel*, *Ann. Soc. Ent. de France*, vi. 88 (1837).

Europe, Syria.

6. PIERIS RAPÆ, *Linnaeus*, sp.

Papilio Rapæ, *Linnaeus*, *Syst. Nat.* ii. 759. n. 76 (1767); *Hübner*, *Europ. Schmett. Pap.* f. 404, 5 (1806-27.)

Pieris Rapæ, *Godart*, *Enc. M.* ix. 161. n. 144 (1819).

Catophaga Rapæ, *Hübner*, *Verz. bek. Schmett.* 93 (1816).

Europe, North Asia, Cachemire, Egypt.

7. PIERIS NAPI, *Linnaeus*, sp., var. (alis multo majoribus).

Papilio Napi, *Linnaeus*, *Syst. Nat.* ii. 760. n. 77 (1767); *Hübner*, *Europ. Schmett. Pap.* f. 406, 7 (1806).

Pieris Napi, *Godart*, *Enc. M.* ix. 161. n. 145 (1819).

Pontia Napi, *Stephens*, *Ill. Haust.* i. 20 (1827).

Catophaga Napi, *Hübner*, *Verz. bek. Schmett.* 93 (1836).

Europe, Siberia.

Note. The Japanese form is one-third longer in expanse of wing than the average size of British specimens.

ANTHOCHARIS, *Boisduval*.

8. ANTHOCHARIS SCOLYMUS, sp. n.

♂ *Alæ anticæ* elongatæ, costa ad venæ costalis finem directa, apice falcato; margine postico obliquo, sub unco sinuato; margine anali convexo; supra niveæ, basi costaque apicali cinereis, apice nigro maculis quatuor luteis interrupto, tertia permagna, alteris minimis, cella macula elongata reniformi nigra terminata.

Alæ posticæ piriformes, supra niveæ notis inconspicuis per alas indicatis, macula nigra in costa apicali, venis nigro acuminatis.

Corpus fuscum; capite olivaceo-pilosato.

Alæ anticæ subtus viridi pro fusco cinereoque, maculis albis nec luteis, aliter velut supra. *Alæ posticæ* virides, maculis albis valde irregularibus variegatæ, margine postico pallidiore, maculis marginalibus hastatis inter venas dispositis.

Corpus cinereum, viridi pilosatum.

Alar. exp. unc. $2\frac{1}{8}$.

Most closely allied to *Anthocharis Genutia*, Bd. (United States), but very distinct.

COLIAS, *Boisduval*.9. COLIAS HYALE, *Linnaeus* sp.

Papilio Hyale, *Linnaeus*, *Syst. Nat.* ii. 764. n. 100 (1767).

Pieris Hyale, *Latreille*, *Gen. Crust. et Ins.* xiv. 113 (1805).

Colias Hyale, *Ochsenheim*, *Schmett. von Europa*, iv. 32 (1816).

Papilio Palæno, *Hübner*, *Europ. Schmett. Pap.* f. 438, 439 (1805?).

Europe, Central India.

10. COLIAS PALLENS, sp. n.

Alæ supra fulvæ, ciliis rufis: *anticæ* pallidæ, elongatæ, angustæ, cella macula nigra terminante, apice cinereo, maculis duabus pallidis subapicalibus; margine postico pallido, cinereo: *posticæ* cinereo roratæ, basi nigrescentes, margine apicali fusco, apud angulum analem pallente maculas quatuor fulvas includente; cella macula flava terminante: corpus cinereum, præ rubescens, antennis rufis. *Alæ anticæ* subtus fulvæ, margine interiore pallido, apice flavo, margine anali punctis tribus nigris submarginato; cella macula terminante. *Alæ posticæ* flavæ, valde cinereo roratæ, costa post cellam macula rufo-fusca;

cella macula argentea terminante, fusco bicincta punctoque fusco præposito.

Corpus flavum, abdomine pallido. Alar. exp. unc. $1\frac{9}{16}$.

Allied to *Colias Hyale*, from which it chiefly differs in its smaller size, elongated narrow front wings, and pale submarginal markings.

ARGYNNIS, *Ochsenheim*.

11. ARGYNNIS MIDAS, sp. n.

Alæ anticæ costa convexa, apice rotundato anguloque anali acuto: supra maculis ut in *A. Paphia* dispositis, venis autem excipe medianam tertiam nec fuscis.

Alæ posticæ quadratæ, area apicali maculis ut in *A. Paphia* dispositis sed majoribus; cella maculis sex terminata in triangulo positis.

Alæ anticæ subtus pallidiores, cella maculisque ut in *A. Paphia*, area apicali maculis olivaceis obscurissimis.

Alæ posticæ nitentes, ochreæ, pallidæ, fasciis maculisque olivaceis variæ, fascia una media indistincta argentea lunulata punctisque nonnullis argenteis inter venas positis. *Corpus* pallidum ochreo-album.

Alar. exp. unc. $2\frac{5}{8}$.

Allied to *Argynnis Paphia* (Europe), from which, however, it may be readily distinguished by its greater size. *Front wings*, costa and apex more rounded, longer inner margin; *above* larger, and only the first median margined with black; *hind wings* more quadrate; *above* with a triangular patch of large black spots at the end of the cell. *Front wings* below with the markings of the outer margin indistinct. *Hind wings*, the markings very obscure, only one central silvery band, which is distinctly lunulated.

12. ARGYNNIS ADIPPE, *Linnæus*, sp.

Var. *Arg. Chloradippe* (anticæ maculis subapicalibus argenteis).

Papilio Adippe, *Linnæus*, *Syst. Nat.* ii. 786. n. 212 (1767).

Acidalia Adippe, *Hübner*, *Verz. bek. Schmett. Pap.* 31 (1816).

Argynnis Adippe, *Ochsenheimer*, *Schmett. von Europa*, iv. 15 (1816).

Papilio Cydippe, *Fauna Suecica*, n. 1066 (1761).

Papilio Berecynthia, *Poda*, *Mus. Græc.* 75 (1761).

Europe.

13. ARGYNNIS LAODICE, *Pallas*, sp.

Papilio Laodice, *Pallas*, *Reise, App.* 470 (1771).

Argynnis Laodice, *Ochsenheimer*, *Schmett. von Europa*, iv. 15 (1816).

Papilio Cethosia, *Fabricius*, *Ent. Syst.* iii. 1143. n. 440 (1793).

Eastern Europe.

14. ARGYNNIS DAPHNE, *Fabricius*, sp.

Papilio Daphne, *Fabricius*, *Mant. Ins.* ii. 64. n. 602 (1787); *Hübner*, *Samml. Europ. Schmett. Pap.* f. 4, 5, 6 (1806-27).

- Argynnis Daphne*, *Ochsenheimer*, *Schmett. von Europa*, iv. 15 (1816).
Brenthis Daphne, *Hübner*, *Verz. bek. Schmett.* 30 (1816).
Papilio Chloris, *Schneider*, *Syst. Besch.* 191. n. 108 (1787).
 Switzerland, Germany, South of France.

ARASCHNIA, *Hübner*.

15. *ARASCHNIA STRIGOSA*, sp. n.

♂. *Alæ anticæ* costa elongata; *posticæ* margine postico valde sinuato, cauda media obtusa.

Alæ supra area basali fusca, strigis ferrugineis pallidis interrupta, fascia media obliqua pallida apud marginem abdominalem bifurcata. *Anticæ* ocello subapicali fusco, albo pupillato, maculisque albis striga ferruginea inclusis submarginatæ; *posticæ* ocellis nigris, fascia lata inclusis submarginatæ. *Corpus* fuscum.

Alæ subtus area basali ferrugineo, fusco alboque variæ; venis albis, fasciaque distincta media alba, ad marginem interiorem bifurcata, ramisque tenuissimis obliquis ad costam basalem anticarum currentibus; area apicali ferruginea, macula magna media violacea, maculisque ochreis variegata, fascia media extus fusco marginata punctisque octo albis inter venas positis; margine postico pallido lineis duabus nigris marginato, posticisque fascia cinerea albo interrupta et marginata. *Corpus* cinereum. *Alar. exp.* unc. $1\frac{3}{4}$.

♀. *Alæ anticæ* costa brevi; *posticæ* margine postico minus sinuato, cauda media distincta.

Alæ subtus fasciis pallidis angustis, margine postico angusto.

Alar. exp. unc. $1\frac{1}{2}$ *.

PYRAMEIS, *Hübner*.

16. *PYRAMEIS CARDUI*, *Linnaeus*, sp.

Papilio Cardui, *Linnaeus*, *Syst. Nat.* ii. 1774. n. 157 (1767); *Hübner*, *Samml. Europ. Schmett. Pap.* f. 73, 74 (1806).

Vanessa Cardui, *Hübner*, *Verz. bek. Schmett.* 33 (1816).

Cynthia Cardui, *Steph., Ill. Haust.* i. 47 (1827).

Papilio Carduelis, *Cramer*, *Pap.* t. 26. f. E, F (1775).

Europe, Asia, Africa, America, Australia, Oceania.

NEPTIS, *Fabricius*.

17. *NEPTIS LUCILLA*.

Papilio Lucilla, *Wiener Verz.* 173, 4.

Nymphalis Lucilla, *Hübner*, *Schmett.* f. 101, 102 (1805-24).

Acca Lucilla, *Hübner*, *Verz. bek. Schmett.* p. 44, n. 394 (1816).

Limenitis Lucilla, *Boisduval*, *Gen. et Ind. Méth.* p. 16 (1840).

Neptis Lucilla, *Westwood*, *Doubl. & Hewits. Gen. Diurn. Lepid.* p. 272. n. 8 (1850).

Austria, South Russia, China.

* Closely allied to *Araschnia Prorsa*, Godt. (Europe), but quite distinct.

18. NEPTIS ACERIS, *Esper*, sp.

Papilio Aceris, *Esper*, *Schmett.* t. 1. f. 3, 4 (1777-1780).

Acca Aceris, *Hübner*, *Verz. bek. Schmett.* p. 44. n. 393 (1816).

Nymphalis Aceris, *Godart*, *Enc. M.* ix. p. 430. n. 255 (1819).

Limenitis Aceris, *Boisduval*, *Icon. Hist.* t. 18. f. 2 (1829-36).

Neptis Aceris, *Westw. Doubl. & Hewits. Gen. Diurn. Lepid.* (1850).

Papilio Plautilla, *Hübner*, *Europ. Schmett. Pap.* t. 99, 100 (1805-24).

Germany, Hungary, South Russia.

LIMENITIS, *Fabricius*.19. LIMENITIS SIBILLA, *Linnæus*, sp.

Papilio Sibilla, *Linnæus*, *Syst. Nat.* ii. 781. n. 186 (1766); *Rösel*, *Ins. Belust.* iii. t. 33. f. 3; t. 70. f. 1-3 (1822-25).

Limenitis Sibilla, *Westw. Doubl. & Hewits. Gen. Diurn. Lepid.* p. 276, n. 5 (1850).

Papilio Prorsa, *Linnæus*, *Mus. Rep.* p. 303. n. 121.

♀ *Papilio Camilla*, *Linnæus*, *Syst. Nat.* ii. 781. n. 187 (1766).

Europe.

DEBIS, *Westwood*.

20. DEBIS DIANA, sp. n.

Alæ supra fusæ; *anticæ* fascia obliqua subcostali brevi pallida post cellam posita; *corpus* fuscum.

Alæ subtus fusæ: *anticæ* fascia alba triangulari, ad angulum analem coarctata; cella lineis duabus nigro-fuscis; margine postico lineis duabus pallidis marginato ocellisque tribus nigris albo pupillatis fulvo, fusco ochreoque circumcinctis submarginato. *Posticæ* lineis duabus mediis super cellam, ad costam approximantibus; margine postico lineis duabus pallidis marginato ocellisque sex submarginato, primo quintoque majoribus. *Alar. exp.* unc. 1½.

Allied to *Debis Dinarbas*, *Hewitson*, but *front wings* comparatively shorter; *hind wings* shorter; costa suddenly arched above the apical ocellus; outer margin much more rounded; central caudal projection almost obsolete; inner margin proportionably much longer.

In coloration and markings it differs as follows:—Upperside, *front wings* with only one pale, oblique, transverse band, two-thirds distant from the base; hind wings not showing submarginal ocelli. Underside olivaceous, instead of reddish brown: *front wings*, transverse band broad at the costa, dirty white, tapering to near the anal angle; subapical ocelli distinct; submarginal lines not waved: *hind wings*, central portion broad in the middle as in *Debis Chandica*, *Moore*; submarginal ocelli slightly larger, the one at the anal angle unequally bipupillate.

NEOPE, *Moore*.21. NEOPE PULAHA, *Moore*, sp.

Lasiommata? Pulaha, *Moore*, *Cat. Lep. Mus. East. Ind. Comp.* p. 327.
n. 477.

India, Japan.

YPHTHIMA, *Hübner*.

22. YPHTHIMA ARGUS, sp. n.

Alæ supra fuscae; *antica* ocello subapicali nigro ochreo cincto alboque bipupillato; *postica* maris ocellis duobus inter venas apud marginem analem positis; feminae ocellis tribus, uno subapicali minuto. *Corpus* fuscum.

Alæ subtus albo-cinereae, fusco strigosae; *antica* maris ocello ut supra; feminae ocello obscuro albo ad cellae finem; *postica* ocellis quinque subapicalibus tribusque analibus, uno anali bipupillato. *Corpus* cinereum. *Alar. exp.* unc. $1\frac{1}{2}$.

Allied to *Ypthima Baldus*, Fabricius (China); differs from it in having five instead of six ocelli on hind wings.

Front wings: costa longer; female showing an extra ocellus at the end of the cell below, also with a small subapical ocellus above.

POLYOMMATUS, *Latreille*.23. POLYOMMATUS EUPHEMUS, *Hübner*, sp.

Papilio Euphemus, *Hübner*, *Eur. Schmett. Pap.* f. 257-259 (1805-24);
Ochsenheimer, *Schmett. von Europa* (1816).

Lycæna Euphemus, *Westw. Doubl. & Hewits. Gen. Diurn. Lepid.*
p. 491. n. 74 (1852).

Papilio Autophylax, *Bergstr. Nom.* t. 51. f. 1, 2 (1779-80).

Papilio Autophonon, *Bergstr. Nom.* t. 53. f. 7, 8.

Papilio Argiades, *Fabricius, Mant. Ins.* ii. p. 70 (1787-88).

Papilio Diomedes, *Naturforsch.* vi. p. 26. n. 14.

Central Europe.

24. Polyommatus Argiolus, *Linnæus*, sp.

Papilio Argiolus, *Linnæus, Syst. Nat.* ii. p. 746 (1766); *Lewin, Brit. Butterf.* t. 36. f. 3 (1795).

Lycæna Argiolus, *Westw. Doubl. & Hewits. Gen. Diurn. Lepid.* p. 491.
n. 61 (1852).

Papilio Thersanon, *Bergst. Nom.* t. 49. f. 5, 6 (1779-80?).

Papilio Argyrophontis, *Bergstr. Nom.* t. 58. f. 5, 6.

Papilio Argalus, *Bergstr. Nom.* t. 60. f. 45.

Hesperia Acis, *Fabricius, Ent. Syst.* iii. pt. i. p. 295 (1793).

Papilio Cleobis, *Esper, Eur. Schmett.* t. 40 (1777-80); *Suppl.* 16, f. 3,
t. 54; *Cont.* 4, f. 4 a, b (1805-24).

Europe.

25. *POLYOMMATUS AMYNTAS*.

Papilio Amyntas, *Wiener Verz.* p. 185; *Hübner, Eur. Schmett. Pap.* p. 322-324 (1805-24).

Lycæna Amyntas, *Westw. Doubl. & Hewits. Gen. Diurn. Lepid.* p. 490. n. 45 (1852).

Papilio Tiresias, *Esper, Pap. Eur.* pl. 34 (1777-1780); *Suppl.* 10, f. 1, 2 (1805).

Southern Europe. China.

26. *POLYOMMATUS LYCORMAS*, sp. n.

♂. Alæ supra cæruleæ, nigro marginatæ, ciliis albis. *Corpus* cæruleo-cinereum; *antennis* nigris, albo fasciolatis.

Alæ subtus pallide cinereæ, basi cæruleo-virides; *anticæ* serie macularum septem nigrarum albo cinctarum apud marginem posticum. *Posticæ* apud basim macula una, fascia irregulari punctorum nigrorum albo cinctorum de costa ad marginem posticum currente. *Corpus* pallide cinereum.

♀. Alæ supra fuscæ, ciliis albis; corpus cinereo-fuscum; subtus velut mari. *Alar. exp.* unc. $1\frac{1}{4}$.

Allied to *Lycæna Iolas*, Ochsenheimer (Europe), differs from it above, in the male having a broad marginal black band to the wings, and the female being entirely black brown; below, in having no marginal spots, and the submarginal band of spots in the front wings being regular. Hind wings with no spots within the cell.

In markings it more closely resembles *Lycæna Bellis*, from which it scarcely differs, except in its much greater size.

*LYCÆNA, Fabricius.*27. *LYCÆNA FERREA*, sp. n.

Alæ supra chalybeo-cæruleæ, marginibus cinereo-fuscis.

Alæ *anticæ* subtus cinereo-fuscæ, cella fusco terminata, fascia post cellam angulata fusca extus pallida post nervulum medianum secundum terminante; *posticæ* fusco-rufescentes, area abdominali cinereo rotatæ, fascia pallida post cellam valde irregulari, ad costam intus albo marginata. *Corpus* fuscum. *Alar. exp.* unc. $1\frac{1}{4}$.

Note.—Our specimen of this insect has the outer margins of the wings much shattered: it seems to have possessed two tails to the hind wings, one at the termination of the first, and the other of the second median nervule, the anal angle also being obtusely produced.

*THECLA, Fabricius.*28. *THECLA ICHNOGRAPHIA*, sp. n.

Alæ supra chalybeo-purpureæ, ad marginem posticum fuscescentes;

posticæ angulo anali in caudam obtusam rufam nigro cinctam producto, venaque mediana prima cauda tenui terminante. *Corpus* fuscum.

Alæ anticæ subtus niveæ, basi fusco-pallidæ, cella ante finem fascia tenui alba, fascia obliqua fusca pallida post cellam posita et ante marginem interiorem terminata; margine postico nigro marginato fasciisque duabus fuscis pallidis submarginato, interiore venis albis interrupta; *posticæ*, area abdominali fusco-pallida, lineis tribus albis apud marginem analem cellaque ante finem linea alba scripta, fascia obliqua fusco-pallida post cellam posita et a veno mediano secundo terminata, margine postico nigro marginato, apicali fasciis duabus pallidis submarginato, interiore venis albis interrupta, angulo anali macula lata quadrata flava maculas quatuor nigras ex æquo distantes includente, cauda anali nigra. *Corpus* pallidum, cinereo-fuscum. *Alar. exp. unc.* $1\frac{3}{16}$.

Allied to *T. Battus*, Cramer.

CHRYSOPHANUS, *Hübner*.

29. CHRYSOPHANUS PHLÆAS, *Linnaeus*, sp.

Papilio Phlæas, *Linnaeus*, *Syst. Nat.* ii. p. 793 (1766); *Hübner*, *Eur. Schmett. Pap.* f. 362, 363 (1805-24).

Chrysophanus Phlæas, *Westw. Doubl. & Hewits. Gen. Diurn. Lepid.* p. 498. n. 4 (1852).

Papilio Virgaureæ ♀, *Scopoli, Ent. Carn.* p. 181 (1763).

Europe, Nova Scotia, United States, Himalayas.

29^a. Var. *Alæ anticæ* macula magna fusca sub cellæ fine posita.

THANAOS, *Boisduval*.

30. THANAOS RUSTICANUS, sp. n.

Alæ anticæ supra basi cinereo-fuscae, lunula nigra apud basim cella inclusa, fascia media extus ochreo-pallida intus olivaceo-fusca lineis nigris marginata et divisa, area apicali cinereo-fusca fasciis olivaceo-fuscis variegata, linea submarginali lunulata pallida; *posticæ* nigro-fuscae, macula media oblonga brevi ochrea macularumque seriebus duabus submarginalium. *Corpus* nigro-fuscum.

Alæ anticæ subtus basi fuscescentes, fasciis duabus fuscis obsoletis post cellam positis et apud marginem interiorem conjunctis, margine postico linea fusca lunulata submarginato; *posticæ* velut supra. *Corpus* fuscum. *Alar. exp. unc.* $1\frac{7}{16}$.

PAMPHILA, *Fabricius*.

31. PAMPHILA SYLVANUS, *Fabricius*, sp.

Papilio Sylvanus, *Fabricius*, *Mant. Ins.* ii. p. 84 (1787-88); *Lewin, Brit. Butterf.* t. 46. f. 1-3 (1795).

Pamphila Sylvanus, *Westw. Doubl. & Hewits. Gen. Diurn. Lepid.* p. 522. n. 2 (1852).

Papilio Comma, *Scopoli*, *Carn.* No. 463 (1763).

Papilio Melicerta, *Bergstr. Nomenkl.* t. 90. f. 1-4 (1779-80).

Europe, England.

Remarks on the Cranial and Dental Characters of the existing Species of *Hyæna*. By GEORGE BUSK, Esq., F.R.S., Sec. L.S.

[Read May 3, 1866.]

THE following observations refer more especially to two points concerning which considerable doubt and confusion have hitherto existed.

(1.) Three, or, as some zoologists have supposed, four species of the genus *Hyæna* are at present in existence; and it is probable that palæontology is acquainted with at least three, and perhaps more, extinct forms. It is not my intention here to advert further to the fossil species than to state that, like the existing ones, they fall into two very natural groups of subgeneric value, and that with respect to some among them it has hitherto been found very difficult, and in some cases impossible, to distinguish them from their existing representatives.

The existing or supposed species of *Hyæna* are:—

1. *HYÆNA STRIATA*, *Zimmerman*.

H. orientalis, *Tiedemann*.

H. vulgaris, *Desmarest*.

H. fasciata, *Thunberg*.

H. antiquorum, *Temminck*.

H. veterum, *Kæmpfer* (*Amœn. Exotic.* 1712, p. 411).

Canis Hyæna, *Linn.*, *Erxleben*, &c. (*Syst. Anim.* 1777).

Lupus marinus, *Gesner*.

Hyène rayée, *Cuvier*.

Striped Hyena, *Pennant*.

2. *H. BRUNNEA*, *Thunberg* (*Vetensk. Acad. Handl.* 1820, p. 59).

H. fusca, *G. St. Hilaire*.

H. villosa, *Smith* (*Linn. Trans.* xv. 1827, p. 462).

Hyène dont la patrie est inconnue, *Cuvier*, *Oss. fossil.* 4th ed. 1835, viii. p. 318.

The Strand Wolf of the Cape.

3. *H. CROCUTA*, *Erxleben* (sp.), *Syst. Règne Animal*, 1777, p. 575.

H. maculata, *Thunberg* (non *Ödmann*).

H. capensis, *Desmarest*.

Canis crocuta, *Erxleben*.

Crocuta maculata, *Kaup* (*Isis*, 1828, p. 1144).

Hyæna sive congener illi *Crocota*, *Ludolf*. (*Hist. Æthiop.* l. i. c. 10).

The Spotted Hyæna, *Pennant*.

The Tiger Wolf of the Cape.

4. *H. MACULATA*, *Ödmann* (*Vetensk. Acad. Handl.* xi. 1, 1820, p. 65).

The first two of these species are distinguished by certain well-marked dental characters, and have on that account and from other peculiarities (according to Kaup, the possession of the anal sacculus) been placed by some zoologists in a distinct genus or subgenus, for which the late Dr. Falconer had proposed to employ the term *Euhyæna*; and, in like manner the last species or last two species, constitute the subgenus, or genus, as some regard it, of *Crocota*, first so named by Kaup. And to this group belongs the commonest form of fossil or Cave Hyæna, *H. spelæa*.

The remarks here offered are intended, in the first place, to point out the distinction that may be drawn from the cranial and dental characters alone, between *H. striata* and *H. brunnea*; and secondly, to inquire what evidence is afforded by those characters, in favour of or against the supposition that there is more than one distinct form of "Spotted Hyæna."

It might be thought that there is little reason or use in entering into a critical examination of such a limited range of parts, concerning the distinctive characters of two such well-marked and undoubted species as *H. striata* and *H. brunnea*. For the mere purpose of distinguishing these forms zoologically, there are, it is quite true, abundant materials in other striking and obvious characters; but when we come to the distinction of species by the bones alone, and more especially to that of the fossil species, and their relationship to existing forms, it becomes a question of the utmost interest to ascertain as precisely as possible the characters derived from the more imperishable and most frequently met with parts of the frame, amongst which the cranium and teeth are perhaps the most important.

With reference to this, and to show how much the importance of such an inquiry has been felt by palæontologists, I will quote some remarks which I find in the notes of the late Dr. Falconer on the subject of the fossil Hyæna from the bone breccia of Gibraltar, to the study of which he had devoted a great amount of labour. He says, "It has been long known to palæontologists that remains of fossil Hyenas specifically distinct from *H. spelæa* abound in the ossiferous caves of the South of France. Latterly they have been detected under similar circumstances in Sicily. But the opinions entertained respecting the specific determination

of these fossil forms and their relations to existing Hyenas have been very conflicting. Much of this uncertainty has doubtless arisen from the imperfect nature of the materials which have come before the different observers; but we believe that it has in a considerable measure been owing to the unsettled opinions among zoologists respecting the number and affinities of the living species, and to the imperfect state of knowledge regarding their osteological distinctive characters, more especially in what relates to the form of the cranium and teeth." He then proceeds to observe, "We shall endeavour before entering upon the description of the Gibraltar fossil form to determine what the osteological distinctions of the living species are." And it is very deeply to be lamented that he did not live to carry out this useful design, towards which the present remarks may be regarded as a contribution.

(2.) But before proceeding to the description of the differences between *H. striata* and *H. brunnea*, I should wish to be allowed to say a few words on the circumstances which have more immediately led to the confusion which exists with respect to *H. brunnea*, at any rate among English palæontologists. As an instance of this it may be stated that Dr. Falconer, than whom no man justly stands higher as an authority in Mammalian Palæontology and Osteology, and my friend Mr. Boyd Dawkins, who bids fair to become his worthy successor, have both assigned to *H. brunnea* three crania which most indubitably do not belong to that species, nor even to the same subgenus, and in consequence of this mistake have been induced to regard *H. spelæa* as closely allied to if not identical with the "Strand Wolf" of the Cape of Good Hope; and I may add that I was myself also naturally led to the same conclusion. The way in which such competent observers as Dr. Falconer and Mr. Boyd Dawkins were led into this error, may, however, be very simply explained.

The only materials, so far as I know, publicly available in London for the study of the osteology of the cranium of the *Hyæna* are to be found in the British Museum and in the Royal College of Surgeons.

In the former place they comprised, until lately, (1.) two skulls of *H. crocuta*, numbered 1232 (*a*) and 1232 (*b*), and another so named in the Palæontological Gallery, numbered 37783; (2.) two skulls, one a good deal broken, named *H. brunnea*, and numbered respectively 822 (*a*) and 822 (*b*); and (3.) a good many skulls of *H. striata*.

In the Museum of the Royal College of Surgeons the materials afforded are (1.) a very fine cranium with the teeth in beautiful condition, named *H. crocuta*, and numbered 4447; (2.) a skull belonging to the entire skeleton of a "Spotted Hyena," which when alive was in the possession of the late Dr. Buckland; and (3.) several crania of *H. striata*.

With respect to the Striped Hyena of course no question could arise; and with respect to the others, as there appeared to be no reason to doubt the correctness of the appellations bestowed upon them, it was naturally assumed that the two crania named *H. brunnea* in the British Museum afforded types of that species. And indeed, as will afterwards appear, upon comparison of these two crania with those of undoubted specimens of *Hyæna crocuta* in the same collection, sufficient differences are at first sight apparent between them to justify any one, in the absence of direct testimony to the contrary, in supposing that they belonged to distinct species. An additional piece of evidence was also believed to be forthcoming, which would have been conclusive as to the point to which species these crania belonged, inasmuch as in the Catalogue an asterisk prefixed to one of them was taken to imply that the stuffed skin of the animal was also in the national collection. Upon comparison again of these two specimens with that numbered 4447 in the Royal College of Surgeons, which was widely different from the cranium belonging to Dr. Buckland's specimen of *H. crocuta*, the characters of the three, allowing for differences of age, &c., were so similar that Dr. Falconer was persuaded that they all three belonged to one and the same species, and that that species was closely allied to if not identical with the fossil Hyena from Gibraltar, and, in all probability, also with *H. spelæa*. He therefore was led to the conclusion that the "Strand Wolf" of South Africa had at one time extended as far North as Gibraltar at least, if indeed it had not at a still remoter period abounded in far more distant northern latitudes. Biassed no doubt by the weight of Dr. Falconer's opinion, Mr. Boyd Dawkins, in his valuable paper on the Dentition of *Hyæna spelæa**, adopted the same view; and, as I have said, it appeared to me also an inevitable conclusion from the premises. No mistake, however, could be greater, or, in a palæontological sense, attended with more important consequences.

Unable to reconcile Mr. Boyd Dawkins's account of the supposed *H. brunnea*, taken from the specimens 822 (b) in the Bri-

* Nat. Hist. Review. No. XVII. p. 80, Jan. 1865.

tish Museum, and 4447 in the College of Surgeons, with what he himself had always regarded as *H. brunnea* or *fusca*, M. Lartet, on the occasion of my being about to visit Paris a short time since, requested me to bring him casts of the dentition of the two specimens in question. Time however only allowed me to procure that of the College of Surgeons specimen. Comparison of this with specimens of *H. crocuta*, *H. striata*, and the true *H. brunnea* in M. Lartet's possession, showed at once that it belonged to the first-named species, or at any rate to the same type, and that it had nothing in common with *H. brunnea*, except perhaps its size. It was from this further evident also that we had no known specimen of that species either in the British Museum or the College of Surgeons. Under these circumstances on my return to London bringing with me an excellent cast of the dentition of *H. brunnea*, I took the first opportunity of making a close examination and comparison of the various Hyena-crania to which I had access. The comparison of the so-termed *Hyæna-brunnea* skulls in the British Museum with those named *H. crocuta* in the same collection, soon satisfied me that there was no essential difference between them sufficient to justify their specific distinction. On further inquiry it also appeared that there was no stuffed skin belonging to either of the crania assigned to *H. brunnea*; nor was I able to learn from Dr. Gray that there were any grounds for attributing them to that species, beyond the circumstance that they had been purchased as such at Mr. Warwick's sale. As they really appeared to differ very considerably from the other two skulls which were certainly known to belong to the "Spotted Hyena," and as no materials were at hand for comparison, no suspicion appears ever to have been entertained that they were misnamed. But in consequence of this absence of any proof that they belonged to *H. brunnea*, and in the presence of their absolute distinctness from that species as exemplified in the cast I had brought from Paris, the conclusion appeared inevitable that the name under which they had been entered in the Catalogue was erroneous. Had any doubt, however, remained on this point, it would have been removed when Mr. Gerrard produced a skin of the veritable *H. brunnea*, containing the skull. But on examination of this specimen it appeared that the bones had been detached from the skin, and then sewn up again in it. When removed it appeared that they had been cleaned; and the name of *H. brunnea* (*sic*) was written on both the cranium and the mandible, which latter, however, was found to belong to another in-

dividual, of smaller size. This circumstance naturally led to the surmise that both the cranium and jaw might both have been substituted for those really appertaining to the hide; but on examination it was clear enough that the latter fitted too exactly to the upper jaw and cranium to admit of any doubt of their belonging to each other. The introduction of a smaller lower jaw of the same species is a curious circumstance, but of no immediate importance.

Comparison of the dentition of these two jaws with the cast of that of *H. brunnea* proved at once that they were identical, and it was thus shown that the national collection was really in possession of a skull of *H. brunnea*. I am happy to say also that Dr. Gray, with his accustomed zeal in the cause of science, has procured from Paris an excellent specimen of the entire cranium of that species, which he has kindly allowed to be exhibited on the present occasion*.

(3.) After this little historical episode, which will serve at any rate to point out the necessity of the utmost caution in doubtful cases, and of the danger of taking anything for granted, I shall proceed to indicate as briefly as I can the chief distinguishing characteristics between *H. brunnea* and *H. striata*, the only existing species with which it can possibly be confounded. But that it can be so confounded, and that by the very ablest observers, will be apparent when it is stated that M. de Blainville, who has given such an excellent figure of the head and teeth of *H. brunnea* in his 'Osteography,' observes that it is impossible to distinguish one from the other by the cranial characters, and consequently is disposed to consider *H. brunnea* only a variety of *H. striata*. And, again, Dr. Falconer, in noticing the actual specimen in the Museum of the Jardin des Plantes from which De Blainville's figure was taken, says with respect to it "that the famous *Hyæna fusca* of Caffraria, brought in 1839 by M. Forestier, and figured by De Blainville, is a true *Euhycæna*, the skull differing in no respect from the skulls of *H. striata*, except in being somewhat larger;" but the "teeth," he says, "differ in this important respect, that the last molar in the lower jaw has not the posterior cusp with an additional cusp developed inside. There is only an adpressed rudiment barely distinguishable. The talon also, though of the same form, is less developed on its crown surface. This tooth on

* I am also able to add that, since this paper was read, the Royal College of Surgeons has procured two excellent crania of *H. brunnea*, the additional materials afforded by which I have incorporated in the text and in the Tables.

the whole approaches in form more that of the *Crocottas*. The carnassier of the upper jaw has three subequal lobes, exactly as in *Hyæna striata*; and the last or tubercular is exactly alike; the last lobe of the carnassier is less indented in *H. fusca*. This, then," he remarks, "is the true *H. fusca* of E. and G. St. Hilaire."

A subsequent note, also made in the Jardin des Plantes, shows how much he was puzzled about *H. brunnea*, as well he might be; and again on the occasion of a visit to examine the Hyæna-skulls in the British Museum, he writes, "Examined the two skulls, *H. crocuta* and *brunnea*. Gray, Cat. p. 69, cites *H. fusca* as a synonym; but this is a mistake;" and he ends the note by saying that he "believes there are four species living, viz. :—

H. crocotta or *maculata*.

H. brunnea.

H. (Euhyæna) fusca.

H. (Euhyæna) striata."

I make these quotations from the brief notes of my lamented friend, not only to show how confused the subject of the different existing species of *Hyæna* was in his mind, and consequently how useful it would be to have it definitively settled for succeeding palæontologists, but also because I am unwilling that anything which can be rescued from his notes should be lost. In the quotation above given it will be seen that his keen and penetrating eye had really perceived the more essential among the dental characters distinguishing *H. striata* from *H. brunnea*, although, from the mistake with regard to the latter species into which he had almost inevitably been led, he, like De Blainville, overlooked the true significance of what he had noticed.

H. striata and *H. brunnea*, so far as regards cranial and dental characters, agree in so many particulars as upon superficial inspection to be readily confounded. The chief points in which they agree are also those in which they both differ from *H. crocuta* and its fossil congeners.

1. In both, the upper tubercular molar is triradicular and tricuspid, and rarely less than 0.5 of an inch in length by 0.2 in its shorter diameter; while in *H. crocuta* and its allies this tooth is normally biradicular and bicuspid, though not unfrequently, by abortion, uniradicular, or entirely absent; and it is never more than 0.2 or 0.21 in length by 0.1 in the shorter diameter.

2. In having the three lobes of the upper carnassial tooth subequal in the antero-posterior direction.

3. In having a more or less distinct accessory point on the inner side of the hinder cusp of the lower carnassial tooth. It is true that a minute tubercle, or rudiment, rather, of a similar point is not unfrequently seen in nearly the same situation in *H. crocuta*, and perhaps still more frequently in *H. spelæa*. But in these species it never assumes anything like the size it presents in *H. striata* and *H. brunnea*, though it is considerably less in the latter species than in the former. Some difference also may be noticed in the exact situation of the accessory point in *H. crocuta* and *spelæa*, in which species it is usually situated as it were in a hollow beneath the base at the inner and hinder border of the posterior cusp; whilst in *H. striata* and *brunnea* it rises distinctly on the inner face of the cusp.

Other points of agreement between the two *Euhyænas* may be noticed—as for instance the presence in both of a distinct anterior talon to the 2nd premolar, and of a well-defined anterior talon to the 1st, 2nd and 3rd premolars, which is larger, however, as are all the talons in fact, in *H. striata*. In *H. striata* and *H. brunnea*, the 2nd and 3rd premolars are placed with their long axis oblique to the line of the alveolar border, and the 3rd premolar is obliquely truncated behind, whilst in *H. crocuta* this tooth is square behind.

The opening of the nares is rounded in *H. crocuta*, and more or less pyriform in *H. striata* and *H. brunnea*, in which also the anterior palatine foramina are very much larger in proportion. Other minor points might be noticed; but the above are abundantly sufficient to indicate the affinity of *H. striata* and *H. brunnea*, and their common distinction from the *crocuta*-group.

Having thus pointed out the more important particulars in which *H. striata* and *H. brunnea* agree, it remains to indicate those in which the difference between them is chiefly shown. So far as the general dimensions of the cranium are concerned, it may be said that, whilst the average length (extreme) of the cranium, measured from the incisive border in front to the point of the sagittal crest behind, appears to be greater in *H. brunnea* (1011 to 904)*, in regard to the zygomatic width the preponderance is greatly in favour of *H. brunnea*, in which this width is on

* It should be stated, however, that these numbers are taken only from my own measurements, according to which the maximum length of the cranium in *H. striata* is 950, but that M. de Blainville gives the maximum for that species at 1070. But this difference may perhaps be due to the circumstance that he has included a specimen of *H. fusca* under that appellation.

the average 644—and in *H. striata* 590, in which species the maximum is 650, and minimum 510, whilst the corresponding numbers in *H. brunnea* are 680, 570. Another particular in which the two species differ is in the interorbital width, which is considerably greater in *H. brunnea* (206 to 181), the maximum and minimum being in *H. striata* 200 and 165, and in *H. brunnea* 215 and 190. The occipital condyles also, measured from outside to outside, show a width of 159 in *H. striata*, and of 200 in *H. brunnea*. In the height of the orbit the two species are pretty nearly alike, and both have it considerably less than *H. crocuta*. The nasals are smaller in *H. striata* than in *H. brunnea*, in which species those bones are larger even than in *H. crocuta*. Passing to the maxilla we find that the width measured from the outside of the 3rd premolars is in *H. striata* 308, and in *H. brunnea* 350 (the maximum in the former species being 335, and in the latter 380), whilst the least transverse measure of the upper jaw in *H. striata* is 198, and in *H. brunnea* 221, showing that in the latter case it is rather more constricted in front. Again, passing on to the teeth, the length of the upper incisor series in *H. striata* is on the average 127, and in *H. brunnea* 139; but when looking to the maximum and minimum in each case, it will be seen that no very great difference in this particular really exists. With respect to the length of the molar series, however, it is widely different; the mean figure for this in *H. striata* is 271, and in *H. brunnea* 312—the respective maxima being 285 and 320.

As regards the individual teeth, those in which the greatest differences are perceptible are the 3rd incisor, the canine, the 3rd premolar, and the 4th premolar, the last two exhibiting considerably greater dimensions in *H. brunnea*.

In the mandible a corresponding want of size will be found in *H. striata*, the maximum length of the jaw, measured from the back of the condyle to the incisive border in front, being in that species 660, and in *H. brunnea* 740—the condyle in the former case measuring 145, and in the latter 170 in transverse diameter. And the other dimensions of the mandible are in agreement with these, as will be seen from the Table.

As to the teeth, the lower incisor series is of about the same length in both species; but the molar series, as a matter of course, corresponds with that of the upper jaw in its greater length in *H. brunnea* (309 to 268, or in the maximum, 320 to 288). The third incisors are about equal, but the canine is considerably larger in *H. brunnea*—the maximum size of that tooth in *H. striata* being

60×40, and in the other 75×50, equalling in fact the size of this tooth in *H. crocuta* *. All the other teeth are also considerably larger in *H. brunnea*; but the greatest differences are observable in the 2nd and 3rd premolars and in the molar. And with respect to the proportionate size of these teeth a remarkable distinction will be seen to exist. Whilst in *H. striata* the mean relative dimensions of the teeth stated in the above order, are 72×44, 78×43, and 81×40, the corresponding sizes in *H. brunnea* are 84×55, 94×53, and 94×50. These figures show not only that the three principal teeth in the molar series are a good deal smaller in *H. striata*, but also that in that species the last or molar tooth is larger than the penultimate, and that the other two are not very greatly different in size; whilst in *H. brunnea* the ultimate tooth is rather less than the penultimate, which, again, is a good deal bigger than the antepenultimate—differences in which it will be seen in the Tables that *H. brunnea* approaches *H. crocuta* and *H. spelæa*.

Having thus indicated the principal differences in dimensions between *H. striata* and *brunnea*, if we proceed to the differences in form, &c., of certain parts of the cranium and of some of the teeth, we shall find equally well-marked distinctions between the two species. Commencing with the cranium, it may be remarked that although in general form the brain-case does not differ very much, yet that it is on the whole more compressed in *H. brunnea*; and especially is this visible in the alisphenoid region, where, in both *H. crocuta* and *H. striata*, the sides of the cranium project abruptly, which is not the case in *H. brunnea*. A difference in the form of the occipital triangle will also be noticed. In *H. striata* as in *H. crocuta*, the lateral ridges by which it is bounded, or the superior occipital ridges, about an inch or an inch and a half below the point of the sagittal spine bend outwards, whilst in *H. brunnea* they descend to the mastoid almost in a continuous even line very slightly convex outwardly (figs. 4, 5); and they are also much more prominent in *H. striata*. The upper border of the sagittal crest is more arched in *H. brunnea*. In *H. striata* the nasals reach almost if not quite to the level of the highest point of the fronto-maxillary suture, whilst in *H. brunnea* they terminate nearly half an inch below it. The infraorbital foramen is larger in *H. brunnea* (0·55 to 0·45†). The width of the zygoma, as before remarked,

* *H. brunnea* is distinguished not only from *H. striata*, but also from *H. crocuta* and *H. spelæa*, by its having the lower canine larger than the upper.

† Probably commensurate with the greater size and abundance of the tactile vibrissæ in that species.

is rather greater in *H. brunnea*; but the zygoma itself is much broader in the vertical direction, and at the same time more hollowed out on the inner aspect. The lower border of the orbit is thicker, and, as it were, more everted in *H. striata*. The auditory opening is larger in *H. brunnea*. The tympanic bulla is rather larger in proportion to the mastoid process in *H. striata*, but of much the same form, otherwise, as in *H. brunnea*; but the posterior vertical border or angle of the mastoid process, forming the continuation of the lateral occipital ridge, is concave or at any rate straight in *H. brunnea*, and convex in *H. striata*, in which species also the point of the mastoid process is much slenderer. The pterygoid gutter is much wider in *H. brunnea*. The form of the palato-maxillary suture is alike in both; and the length and breadth of the palatals are pretty nearly equal, but are rather wider, however, in the latter species.

In *H. brunnea* the lower border of the horizontal ramus of the mandible is much more convex; the coronoid process longer and more reclined, arching backwards, in fact, beyond the condyle, whilst in *H. striata* it is greatly in front of it; and in *H. brunnea* the anterior border of the coronoid process on the outer surface projects into a high sharp ridge with a deep concavity behind it, which is altogether wanting in *H. striata*. The angular crochet is much broader and shorter and more upturned in *H. brunnea*. As has been before noticed, the mandibular condyle is much wider in *H. brunnea*. The dental foramen is small and rounded in *H. striata*, larger and elongated in a vertical direction in *H. brunnea*. The mandible generally is thicker or more robust in *H. brunnea*.

In the individual teeth we may remark that in the maxilla, besides the differences in dimensions which have already been adverted to, considerable differences in form will be apparent. The tubercle of the carnassial is larger and more rounded or bombé in *H. brunnea*. The anterior talons of the 2nd premolar and of the 3rd premolar are much more developed in *H. striata*. The canines and incisors are very much alike, except that the former are larger in *H. brunnea*, and the tubercular molars are indistinguishable. In the mandible the incisors are more in advance of the canines in *H. striata*. The anterior talons of the 2nd and 3rd premolars, as in the maxilla, are very much more distinctly developed in *H. striata*.

From what has been said, it will be apparent that the distinctions between the cranial and dental characters of *H. striata* and *H. brunnea* are in themselves sufficiently well marked to enable us, where the characters are ascertainable, readily to distinguish

between these two species. The principal points, as it seems to me, to which attention should be directed, are:—

1. The form of the cranium.
2. The shape of the occipital triangle.
3. The width of the condyles.
4. The width of the pterygoid gutter.
5. The expansion and breadth of the zygomatic arch and of the zygoma.
6. The size and proportion and form of the teeth, and more especially of the upper and lower carnassials, and of the upper and lower 2nd and 3rd premolars and canines. The relative size of these two teeth and the proportionate degree of development of their anterior talons are of all characters the most striking and the most readily available.

(4.) With the objects I had in view in drawing up these observations, I have thought it unnecessary to indicate all the secondary points in which *H. brunnea* differs from *H. crocuta*. No one can have any difficulty in distinguishing them; and all the information I can afford, so far as comparative measurements are concerned, will be found in the Tables accompanying this paper. I shall therefore merely offer a few observations on the subject of the existence of two distinct forms of “Spotted Hyena,” as evidenced in the cranial and dental characters. But before entering upon that subject I may be allowed to say a few words with respect to the opinions that have been published regarding the existence of two kinds of “Spotted Hyena.”

Pennant, who was the first to lay down, in 1771, the generic distinction between *Canis* and *Hyæna*, was also the first clearly to describe a second species of the latter genus under the name of “Spotted Hyena,” taking his description, as he says, from a living specimen which had been exhibited in London a few years before. In 1777 Erxleben*, though still arranging *Hyæna* under the Linnean genus *Canis*, adopts Pennant’s “Spotted Hyena” as a species, and translating his description into Latin, gives the species the name of *Canis crocuta*, citing as synonyms the “*Hyæna, sive congener illi Crocuta*,” of Ludolphus, *Æthiop. lib. i. c. 10*, p. 50; and the Quamberg of Barbot, *Guin. p. 86*, and the Jackals or Boshund of Bossman, *Travels in Guinea, p. 291, &c.* Amongst the characters of this West African species, he gives “*cauda brevis, nigra, villosa*.” In a brief communication in Oken’s “*Isis*” for 1828, p. 1144, Kaup observes that the common and the spotted Hyenas differ so widely that they may very properly be

* *Systema Regni animalis, &c. Lipsiæ, 1777, p. 575.*

regarded as the types of two distinct genera, which bear the same relation to each other as do the Linnæan subgenera or (as he would himself regard them) genera of *Civetta* and *Genetta*. He instances among other particulars in which these genera may be said to present analogous characters, the presence in *Civetta* and the absence in *Genetta* of the anal follicle, as well as the possession by the former genus of an erectile mane, and of stripes, &c., in which it resembles the "Striped Hyena;" whilst the spotted fur of *Genetta* and the absence of an anal pouch and of a mane would point out the analogy between that genus and that of *Crocota**. He consequently regards Pennant's genus *Hyæna* as a family containing two genera *Hyæna* and *Crocota*, with respect to the latter of which he says, "Two species can with certainty be referred to this genus, both of which must have lived in Europe. One species still lives in Africa, and this the *H. crocota*." Under these two species of *Crocota* it is obvious that Kaup included *H. spelæa* as the one which formerly inhabited Europe. And it is clear that he recognized only one species of the genus besides this.

Cuvier† observes that there are two varieties pretty well marked, if not species, among the spotted Hyenas. "Some," he says, "are of a whitish grey approaching tawny, and have brown spots, round and well defined, on the flanks and thighs; those on the shoulder form a band which is continuous with a longitudinal brown line on each side of the neck; the feet are whitish, tinged with red towards the bottom; the tail is ringed with white and brown at the base, and blackish in its lower two-thirds; the head, of the same general colour as the back, presents a little brown towards the cheeks, and of red towards the vertex.

"Other spotted Hyenas have a denser coat, of a decided reddish grey; the underside of the neck and of the body, only, whitish; the blackish spots, which are ill defined, occupy the sides, the haunches, and the thighs, and a blackish band is also visible on each side of the neck; the legs and feet are blackish; but the inner side of the fore legs is reddish white; the tail is of a rusty brown colour for its first half, and blackish for the rest of its length. The head is reddish, blackish in front and between the eyes; the lower part of the forehead rusty brown." "This variety," he says, "is common round the Cape."

* Having lately examined a living *H. crocota* in the Zoological Gardens, I can confirm Kaup's statement that no trace of a pouch between the root of the tail and the anus exists, at any rate in the male of that species.

† *L. c.* p. 319.

In a Paper under the title of "Tillägg om Släktet Hyæna," or "Supplement respecting the genus *Hyæna*," which seems to have been intended as an Appendix to Thunberg's immediately preceding paper, in which *H. brunnea* is described, S. Ödmann enumerates four existing species of *Hyæna*, viz. :—

1. *Hyæna fasciata*.
2. *H. crocuta*.
3. *H. maculata*.
4. *H. brunnea*.

The distinctive characters he gives of *H. crocuta* and *H. maculata* are :—

1. *H. crocuta*, rufo-fusca, maculis triquetris vel oblongis, nigris, cauda elongata.

And the synonyms he assigns to it are :—

Crocuta (sive) "congener Hyænæ," Ludolphus, Hist. Æthiop. L. 1. cap. 10. § 51.

Canis crocuta, Schreber.

2. *H. maculata*, ferrugineo-fusca, maculis distinctis nigris, cauda brevi.

Syn. Pennant's "Spotted Hyena."

The Tiger Wolf of the Cape Colonists, &c.

The principal grounds adduced by Ödmann in favour of this distinction between the two forms of "Spotted Hyena" appear to be derived from the description given of it by Schreber*, who, at first having doubted whether Pennant's "Spotted Hyena" was more than a variety of *H. striata*, was afterwards satisfied of the contrary by the receipt of a drawing accompanied with a description taken from a living specimen of a "Spotted Hyena." But this drawing and description differed in the points above indicated from the figure and description given by Pennant; and as both are said to have been described and figured from nature, Ödmann conceived that it was impossible two such dissimilar animals should belong to the same species. I have not, however, as yet met with any zoologist who is acquainted with a long-tailed "Spotted Hyena;" and with respect to the shape of the spots and the varying tints of colour, these characters would not seem sufficient in the absence of more fixed ones to justify us in making two species out of *Hyæna crocuta*. And with reference to this I may state that there are at the present time four living Hyenas in the gardens of the Zoological

* Säugethiere, T. iii. p. 374. tab. xcvi. B, *Canis crocuta*.

Society, viz.:—*H. striata*, *H. brunnea*, and two specimens of *H. crocuta*, one from South Africa, and the other, a more recent acquisition, from the west coast of Africa. I have attentively observed these two animals, which are both males, though doubtless of different ages, and am unable to perceive any difference between them, except in colour. The one from South Africa is generally much darker-coloured and browner, especially on the back and legs, and, owing perhaps to this universal darker hue, the spots are not so well defined as they are in his neighbour; and they appear to me to be rather smaller and less angular in outline than in the specimen from the West Coast. The hair also is somewhat longer, especially on the ears, in the South African form. But in the shape and size of the ears, and in general habit and stature, there is no difference whatever between the two animals. In both the tail is equally short, although the West African Hyena in this instance seems to have the habit of carrying his caudal appendage turned up. The animals are clearly of the same species.

There are no sufficient grounds, therefore, as it seems to me, at present for believing that Schreber's long-tailed Hyena was more than an instance of an individual peculiarity, even if its length of tail were not due merely to inadvertence on the part of the draughtsman. We have still therefore to seek for further evidence of a more decided nature to determine the question of the number of species or well-marked varieties of "Spotted Hyena." Having no other materials for the purpose, I have sought for this evidence in the cranium and teeth, with the results I am about briefly to detail.

I have already stated that the British Museum collection contains five crania belonging to the subgenus *Crocuta*. But of these, two, viz. nos. 1232*a* and 1232*b*, differ so widely at first sight from the others, and more especially from those numbered 822*a* and 822*b*, as even after considerable study to have led excellent observers to conclude that they belonged to distinct species. A third cranium, presenting exactly similar characters to nos. 1232*a* and 1232*b*, exists in the Hunterian Museum. It forms part of the skeleton of the *Hyæna crocuta* formerly in the possession of the late Dr. Buckland (No. 4446, R. C. S.).

For convenience I propose to denote these three crania as *H. crocuta*, A, and the other two as *H. crocuta*, B; and the comparative measurements of the two forms will be found in columns II. and V. of Table V. Inspection of the figures in these columns

will show—1. that in the form A the length of the cranium is much less than in the other—that is to say, in the proportion of 993 to 1090; 2. that the zygomatic width is also less, in the proportion of 703 to 715; and in fact that all the other cranial measurements are less, except the interorbital width, which in form A exceeds that of the other in the proportion of 240 to 225. In the maxilla we find a very remarkable difference in the length of the palate, which in the form A is represented by 470, whilst in B it amounts to 550, and that the length of the palatals is in the former case 199, and in the latter 240*. These figures show that the length of the upper jaw is considerably greater in form B; but when we come to the width, the same difference does not obtain, the transverse diameter of the maxilla, both at the 1st premolar and at the 3rd premolar, being exactly the same in both cases. And the same thing is apparent in the dimensions of the incisor and of the molar series—the former being absolutely wider in A, in the proportion of 165 to 150, whilst the latter series of teeth measures in it only 310, and in B 335. We perceive therefore that the maxilla in form A is, as compared with the other, disproportionately short and wide. On comparing the individual teeth, even more important differences in dimensions are found to exist. The 3rd incisor, notwithstanding the greater length of the incisor series, is considerably smaller in form A than the corresponding tooth in the other form, or in the proportion of 46×35 to 60×40 . The same disproportion is found in the canine, and in even a still greater ratio in the remaining teeth, and especially in the 3rd and 4th premolars. In the 3rd premolar the difference may be expressed by the figures 71×60 and 100×70 , and in the 4th premolar by 130×44 and 150×85 .

Corresponding differences, as may be supposed, exist in the mandible and its teeth. The only dimensions in which the lower jaw in the form A exceeds the other are its height under the molar, expressed by the figures 174 and 170, its width at the 2nd premolar (302 and 300), and the length of the incisor series (125 and 120). We see therefore in this jaw as well as in the maxilla a disproportionate width in comparison to its other dimensions, as will be more clearly seen on reference to the Table. The much smaller dimensions of the teeth are even more strongly marked in the mandibular than in the maxillary teeth; as an instance, I would notice the comparative numbers standing opposite the molar, viz. 106×46 and 120×52 .

* But there is reason to believe that the length in this case is exceptional.

The above statement, together with the figures given in the Table, is sufficient to show that there is every excuse to be made for those who upon comparison of the two crania 1232 *a* and 1232 *b* in the British Museum with those of the B form, numbered 822 *a* and 822 *b*, should have regarded them as specifically distinct. But the two latter specimens might be exceptional, and it was necessary to compare them with others bearing the same general type, but of less dimensions and of younger age. Fortunately means for doing this existed in the crania No. 4447 of the Royal College of Surgeons and No. 37783 in the British Museum. The latter, as will be seen in Table IV., is of small dimensions; but the mean of these two crania, though generally less than in 822 *a* and 822 *b*, is yet greatly in excess of No. 1232 *a* and 1232 *b* &c. The chief exceptions to this rule are, the zygomatic width, which in the form A is 703, and in the others 660; the aural width, 385 and 370; and the interorbital width, 240 and 225; the transverse diameter of the maxilla at the 3rd premolar, 410 and 390, and at the 1st premolar, 260 and 242; and the length of the incisor series, 165 and 151. In the mandible the long diameter of the condyle is rather greater in form A, and the depth under the molar considerably greater. The diasteme also is somewhat longer. But in the size of the individual teeth the preponderance is almost equally great against form A as we found it to be in the case of form B. In a cast of the mandible of *H. crocuta* in the possession of M. Lartet, taken from a specimen belonging to M. Verreaux, of Paris, I took the measure of the lower molar series, and found the numbers opposite each tooth to correspond pretty nearly, though all are somewhat bigger, with those of form B.

Having thus gone over the principal numerical differences between the various forms referred to *H. crocuta*, I would offer a few remarks on the other differences observable between them.

1. In both the crania of the form B, the infraorbital foramina are more compressed than in form A, in which these openings are larger and rounder. 2. A very remarkable difference exists in the much greater size of the tympanic bullæ in form B, in which they are rounded and inflated, and tolerably even on the lower surface, which extends downwards rather below the level of the point of the mastoid process. The same size and form exists in the cranium No. 4447 of the Royal College of Surgeons; but in No. 37783 of the British Museum, a beautiful specimen of a Wild Hyena from Natal, these bullæ are very

much less inflated, and are angular on the under surface. In all three specimens of form A the bullæ are very flat and angular. 3. In all the three instances comprehended under form A the upper tubercular molar is either entirely wanting without leaving even the trace of an alveolus, or is extremely minute; whilst in form B it has the dimensions given in the Table, and where it is wanting it has left a distinct and well-formed biradicular alveolus. Secondly, the digital fossa at the root of the upper carnassial is much shallower in the form A. The palato-maxillary suture in form A is rounded in front, and does not extend forwards beyond the level of the 4th premolar, whilst in 822*b* it forms an acute angle in front and reaches to nearly the middle of the 3rd premolar. In 822*a* this part of the palate is wanting. But in the crania No. 4447, Royal College of Surgeons, and No. 37783, British Museum, this suture is rounded as in form A; whilst again in M. Lartet's cast above referred to it is angular in front; so that I am in doubt as to the value to be placed on the form of this suture as a diagnostic mark, and merely record the facts for future consideration. With respect to the individual teeth, little can be said, on account of the very imperfect state in which the majority of them exist in the three A crania. I may observe, however, that, besides its far smaller size, the 4th premolar is remarkable, in form A, for the proportionately small size of its anterior cusp, which is merely represented by a rounded tubercle, which is so much lower than the others as to be almost untouched by wear, although the latter are much worn. And the internal tubercle is also much smaller and more rounded. I will here add what I find in Dr. Falconer's notes respecting his comparison between 1232*a* and 1232*b* and 822*a* and 822*b*. Regarding the latter as *H. brunnea*, he says of it:—

(a) The cranium is proportionally longer and higher.

(b) The cerebral case is less inflated and more compressed upwards.

(c) The sagittal crest is longer, much higher and more pronounced, and it projects further backwards beyond the condyles.

(d) The auditory bullæ are much more inflated.

(e) The facial portion is more elongated and less strangled.

(f) The infraorbital region is higher, more convex and narrower.

(g) The lower rim of the orbit is broader and more lip-like in *H. striata*. With respect to the mandible he remarks:—

(a) The horizontal ramus is less suddenly turned upwards behind.

(b) The form of the coronoid process more resembles that of *H. striata*, but its anterior edge is more reclinate than in that species.

Now, are the differences between the two forms A and B sufficient to determine their specific distinction? and if not, how are such apparently important differences to be accounted for?

I am inclined to think that the former part of this question should be answered in the negative, and that a tolerably satisfactory reply can be made to the second.

The first thing that strikes one is, that the three animals which have been taken as types of form A have all died after long confinement in menageries, into which they were probably brought when young, and, it may be, before the second dentition was completed. In all three the teeth, as a dentist would observe, are in a "shocking state," and in fact the greater part of them are either entirely wanting or in such a condition as to have been nearly unserviceable. It is quite impossible that animals in this condition could have maintained themselves in the wild state. Accompanying this condition of the teeth, the jaws will be found to present considerable evidences of morbid action, having the texture of the bone porous, and in fact in a state of interstitial atrophy; and their softened or yielding consistence may be seen, more especially in Dr. Buckland's specimen, in the abrupt expansion of the alveoli on each side of the mandible and, in less degree, of the maxilla. We can thus account for the comparatively greater width of the jaws. In like manner I think all the other differences, including even that which is observed so remarkably in the size of the tympanic bullæ, but more certainly in the degree of development of the sagittal crest and other processes for muscular attachments, may be attributed to the unnatural mode of life, and perhaps also in some degree to the preternaturally prolonged existence of the caged animals. The most difficult point to get over, as it seems to me, is the absolutely smaller size of the individual teeth. We cannot of course suppose that these would diminish in size (except by wear) after they were once fully extruded; and the only explanation I can offer of this circumstance is, that the animals may have been brought into confinement at an early age, and that the permanent teeth had become in some measure interrupted in their development, in consequence of the altered conditions in which they were placed. These considerations will at any rate serve to show how dangerous it is to rely upon conclusions drawn from the study

of animals that have long lived in an unnatural condition—a necessity which, as observed by M. de Blainville, has heretofore thrown great difficulties and, as we have reason to believe, considerable confusion upon the subject of specific distinctions in the Hyenas.

But the same observations apply with equal force to every part of the skeleton; and, speaking in the name of palæontology, it is deeply to be regretted that there are at the present time no means whatever of studying the osteology of either *Hyæna crocuta* or *Hyæna brunnea* in the wild state; and I am not even sure that any skeleton of a really wild *H. striata* is to be found in either the British Museum or the Hunterian Museum. Fortunately we have now sufficient means of studying the cranial and dental characters of the three living species; but palæontologists want more than this, and it is much to be hoped that no endeavours will be spared to procure complete skeletons also of each species in the wild state.

Explanation of Tables.

In the first four following Tables I have collected the various cranial and dental measurements which have appeared most suited to show the peculiarities, so far as dimensions are concerned, of the different species and varieties of *Hyæna*. At the bottom of these Tables the numbers relating to each particular are reduced to a mean; and in Table V. these means are placed in parallel columns, so that the differences between the different forms in each item will be seen at a glance. And in the same Table are also given the maximum and minimum measures of each part as observed by myself. Except perhaps in the case of *H. striata*, the number of instances upon which the mean dimensions are founded are not sufficient to afford perfectly reliable data; but they are sufficient for my immediate purpose, of showing, 1st, the distinctive characters between *H. striata* and *H. brunnea*, and, 2nd, the extreme diversities observable more especially between the wild and the caged specimens of *H. crocuta*. I have added a few measurements of *H. spelæa*, more to show how such results as have been obtained may be applied in the comparison of the fossil forms *inter se* and with the existing species than with any intention of including that species in the present inquiry. But I may remark that the comparison of the absolute and relative sizes of the various teeth in both jaws of *H. crocuta* (*fera*) and *H. spelæa*, though showing generally an advantage in favour of

A STRIATA.

2nd pm.	3rd pm.	4th pm.	m.	2nd pm.	3rd pm.	m.
60×40	80×50	120×70	55×2 35	70×42	80×45	80×40
66×40	90×60	120×77	50×2..	.....	.....	.....
60×35	75×55	110×66	49×2 30	70×40	78×40	77×40
60×35	76×50	110×70	50×2 30	70×41	72×40	80×40
60×40	85×60	120×72	50×2 35	75×48	80×45	85×40
65×40	80×50	120×69	50×2 30	75×46	80×41	80×40
60×40	75×51	115×70	50×2..	.....	.....	.....
.....	.....	.....	..... 35	70×45	75×45	81×40
65×40	80×52	120×70	50×2 33	75×47	80×45	82×40
62×40	80×52	117×70	50×2 32	72×44	78×43	81×40

A BRUNNEA.

66×45	90×60	140×85	50×2..	.....	.....	.....
70×45	92×65	140×85	51×2 45	80×55	95×55	95×45
.....	.....	.....	..... 41	80×52	90×51	90×50
70×50	100×67	150×90	55×2 50	90×60	95×55	95×50
66×45	91×60	140×82	50×2 45	85×52	95×53	97×50
68×46	93×63	142×85	51×2 45	84×55	94×53	94×50

A CROCUTA.

(otiva.)

55×45	71×60	120×52	..... 40	70×50	70×50	100×40
50×40	.....	140×77	..... 35	80×55	85×50	110×47
.....	.....	140×	.....	.....	.....	110×50
53×43	71*×60	133×65	..... 37	75×53	78×50	106×46

A CROCUTA.

(fera.)

60×48	90×66	150×80	20×1 40	80×56	90×50	110×47
70×50	90×70	135×85	20×1 40	85×60	90×55	120×50
69×50	100×70	145×84	..... 50	90×60	90×55	120×55
70×50	100×70	150×85	20×1 48	90×62	90×51	120×50
68×50	90×70	150×85	..... 41	82×55	95×50	120×50
67×50	94×70	146×84	20×1 44	85×60	91×52	120×50

mean numbers of the upper and lower individual could be compared.

TABLE I.—HYÆNA STRIATA†.

Specimen.	CRANIUM.										MAXILLA.											MANDIBLE.																			
	Extreme length.	Length from incisive border to condyles.	Zygomatic width.	Alar width.	Frontal width.	Interorbital width.	Width of condyles.	Height of cranium.	Height of orbit.	Length and breadth of nasals.	Length of palate.	Length and breadth of palatals.	Width at 3rd pm.	Width at 1st pm.	Height of alveolus.	Incisor series.	Molar series.	3rd incisor.	Canine.	1st pm.	2nd pm.	3rd pm.	4th pm.	m.	Length.	Length of condyle.	Height at m.	Width at 2nd pm.	Width at diastema.	Length of diameter of symphysis.	Height of coronoid process.	Incisor series.	Molar series.	3rd incisor.	Canine.	1st pm.	2nd pm.	3rd pm.	4th pm.	m.	
No. 136*, B.M. ...	950	...	650	325	...	200	160	...	160	220X80	435	.....	335	205	110	140	280	40X30	60X40	25X25	60X40	80X50	120X70	55X21	630	145	165	235	...	50	230	...	165	25X25	60X40	60X45	200X41	80X45	80X40	
No. 136*, B.M.	610	320	175	430	145X	310	205	100	125	285	40X40	60X40	20X20	66X40	90X50	120X77	50X25
No. 136*, B.M. ...	920	...	570	305	...	165	162	...	160	215X80	430	150X	295	195	110	130	268	40X40	60X40	22X20	60X35	75X55	110X66	49X24	600	115	140	210	...	43	190	...	160	370	21X41	60X40	60X40	200X40	78X40	72X40	
No. 136*, B.M. ...	780	...	510	280	...	180	150	...	149	210X80	370	390	190	60	120	250	37X30	60X45	22X20	60X35	78X50	110X70	50X24	570	110	122	210	...	40	190	...	160	110	23X25	60X40	60X40	200X41	78X40	72X40	
No. 136*, B.M. ...	1000	...	640	320	...	200	161	...	170	250X95	480	171X170	320	205	110	130	275	40X35	70X40	25X25	60X40	85X60	120X72	50X20	600	140	145	210	...	50	200	...	133	.....	60X45	60X45	25X48	80X45	84X40	
No. 136*, B.M. ...	910	...	570	300	...	170	155	...	170	230X80	420	145X	305	190	90	120	270	37X30	65X40	26X16	60X40	80X50	120X69	50X21	600	130	132	210	...	47	180	...	160	165	25X40	55X40	50X30	75X40	80X41	80X40	
No. 449, R.C.S. ...	860	800	575	280	130	170	155	325	155	195X70	405	147X180	315	185	142	120	267	40X30	55X40	20X20	60X40	75X51	115X70	50X20	650	125	130	...	...	40	180	...	...	...	55X40	50X35	70X45	75X45	81X40	
No. 4450, R.C.S.	640	130	145	155	...	140	190	300	...	272	...	50X40	55X35	73X47	80X45	81X40	
No. 4448, R.C.S. ...	910	835	590	315	140	180	170	370	165	220X90	430	155X	300	205	105	130	275	40X30	55X40	65X40	80X52	120X70	50X20	
Mean	904	817	590	306	135	181	159	347	163	220X82	425	152X175	308	198	103	127	271	39X32	61X41	23X22	62X40	80X52	117X70	50X21	611	130	139	219	140	45	191	100	120	268	24X21	64X41	52X31	78X44	78X41	81X40	

TABLE II.—HYÆNA BRUNNEA†.

No. 1, B.M.	1040	...	655	345	...	215	200	...	165	237X90	475	360	235	142	144	305	46X38	70X50	25X25	66X45	90X60	140X85	50X30
No. 2, B.M.	920	670	340	160	210	200	365	165	260X100	480	145X200	380	230	...	140	315	40X37	65X50	25X22	70X45	92X65	140X85	51X30	730	170	170	270	150	50	200	115	125	110	25X20	70X50	60X45	80X55	95X55	95X45
No. 3, B.M.	mandible only.
No. 447, R.C.S.†	1030	940	680	330	180	210	201	360	165	255X95	480	145X185	360	230	130	145	320	40X37	70X52	30X25	70X50	100X67	150X90	55X25	740	165	170	270	155	40	230	130	110	320	25X30	75X50	70X40	90X60	95X55	95X50
No. 447, R.C.S.†	935	870	570	330	160	190	200	310	160	237X90	450	140X165	325	210	130	110	310	40X36	66X50	30X20	66X45	91X60	140X82	50X20	630	150	140	240	150	40	230	123	100	300	25X30	70X50	60X45	85X54	95X51	97X50
Mean	1011	910	644	336	166	206	200	345	164	247X94	472	143X183	356	221	133	139	312	42X37	67X51	27X25	68X46	93X61	142X85	51X21	706	164	159	257	151	41	205	309	113	309	26X26	72X50	62X45	84X55	94X51	94X50

TABLE III.—HYÆNA CROCUTA.

(Var. *captiva*.)

No. 1232*, B.M.	930	...	700	95	...	250	195	...	175	210X110	460	200X160	410	260	150	145	320	45X35	55X40	20X20	55X45	71X60	120X52	615	180	185	305	...	45	205	...	120	262
No. 1232*, B.M.	1000	...	685	370	...	250	190	...	170	200X110	470	200X	...	260	115	185	330	47X	55X40	20X20	55X40	71X60	120X52	640	160	175	300	...	40	210	...	130	300
No. 446, R.C.S. ...	1050	...	725	390	155	220	180	230X115	480	195X	62X42	20X27	50X40	...	140X77	690	165	162
Mean	993	...	703	385	155	240	193	...	175	213X112	470	200X160	...	260	133	165	310	46X35	58X41	25X23	53X43	71X60	133X65	648	168	180	303	...	42	207	...	125	280

TABLE IV.—HYÆNA CROCUTA.

(Var. *fera*.)

No. 447, R.C.S.	1080	995	700	400	200	250	180	400	200	230X120	480	200X215	410	260	130	146	330	50X38	70X45	31X25	65X48	90X66	150X80	20X11	740	190	200	295	155	50	260	100	118	330	30X30	60X50	60X40	80X56	90X50	110X47
No. 447, R.C.S.	1020	960	665	375	180	230	200	380	175	220X125	495	210X210	400	250	130	155	330	50X40	75X50	30X25	70X50	90X70	135X85	20X11	660	160	155	285	155	35	215	150	125	330	32X31	65X50	57X40	85X60	90X55	120X50
No. 822*, B.M.	1060	...	700	395	...	225	190	...	207	257X120	...	.....	400	255	150	150	329	50X45	75X55	30X30	69X50	100X70	145X84	.....	690	170	...	391	...	...	...	...	...	...	70X50	67X40	90X60	90X51	120X50	
No. 822*, B.M.	1120	...	730	395	...	225	210	...	210	250X140	550	240X230	430	270	155	150	340	60X40	80X50	30X30	70X50	100X70	150X85	20X11	750	190	172	315	...	40	240	...	130	358	35X31	75X50	70X48	90X62	90X51	120X50
No. 3778*, B.M.	1065	...	655	370	180	220	185	242X120	500	205X220	380	235	145	147	334	50X35	80X50	30X25	68X50	90X70	150X85	710	155	165	35	235	...	125	340	35X35	60X45	62X41	82X55	95X50	120X50
Mean	1069	977	690	387	190	230	195	390	196	240X125	506	214X219	405	254	138	149	333	52X40	76X50	30X27	67X50	94X70	146X84	20X11	710	173	164	303	155	40	235	350	123	340	32X32	66X49	63X44	85X60	91X52	120X50

† This is the skull of a very young animal.

† In *H. brunnea* and *H. striata*, the mean numbers of the upper and lower canines are taken only from the three cases in which both jaws of the same individual could be compared.

OF HYÆNA.

H. CROCUTA.		H. STRIATA.		H. BRUNNEA.	
No.					
Max.	Min.	Max.	Min.	Max.	Min.
120	930	1000	780	1040	935
*					
295	.....	.....	.....	940	870
330	655	650	510	670	650
495	370	325	280	345	330
5...	.....	.....	.....	160	160
650	220	200	165	215	190

TABLE V.—COMPARATIVE MEASUREMENTS IN DIFFERENT SPECIES OF HYENA.

No.		H. CRUETA.	H. CRUETA, capitata A.	H. CRUETA, fem.	H. CRUETA, fem minor.	H. CRUETA, fem major.	H. CRUETA, Caud.	H. STREATA.	H. BENTLEYI.	H. BYRONI.	H. CRUETA.		H. CRUETA.		H. CRUETA.	
											Max.	Min.	Max.	Min.	Max.	Min.
1.	Extremo length of cranium...	1036	993	1069	1045	1090	.....	984	1005	1030	1120	930	1000	780	1040	935
2.	Length from occipites .....	.....	.....	.....	995	.....	.....	817	895	.....	.....	.....	.....	.....	.....	800
3.	Width, zygomatic	694	703	690	660	715	.....	590	632	740	730	615	600	610	600	800
4.	Width, aural	384	385	387	370	395	.....	306	318	.....	395	370	375	350	345	310
5.	Width, frontal .....	.....	.....	190	.....	.....	.....	135	160	.....	.....	.....	.....	.....	160	160
6.	Width, interorbital	231	240	230	225	225	.....	181	205	260	250	280	200	165	215	190
7.	Width of condyles	200	193	195	200	200	.....	159	200	220	210	190	170	150	200	200
8.	Height of cranium .....	.....	.....	390	.....	.....	.....	.....	335	.....	.....	.....	.....	.....	305	310
9.	Height of orbit	186	175	196	180	203	.....	163	163	.....	207	170	175	149	165	160
10.	Length and breadth of nasal	230 X 120	213 X 112	242 X 126	230 X 120	250 X 130	.....	225 X 82	244 X 95	.....	237 X 120	200 X 110	200 X 95	195 X 70	260 X 100	230 X 90
11.	Length of palate	490	470	506	500	550	.....	425	468	.....	550	460	480	370	480	450
12.	Length and width of palatal	200 X 230	199 X 260	214 X 211	207 X 220	240 X ..	.....	152 X 170	143 X 182	.....	240 X 200	195 X 210	171 X 8	145 X 8	145 X 8	130 X 160
13.	Width at 3rd pm.	410	410	405	390	410	.....	308	355	.....	437	380	335	290	380	325
14.	Width at 1st pm.	260	260	254	242	260	.....	198	222	290	270	235	205	185	235	210
15.	Height of alveolus	140	133	140	126	150	.....	103	136	.....	155	115	142	60	142	130
16.	Incisor series	150	165	149	151	150	.....	127	138	.....	185	145	140	120	142	130
17.	Molar series	320	310	334	334	335	.....	271	312	370	340	300	235	250	310	305
18.	3rd incisor	50 X 40	46 X 35	52 X 40	50 X 40	60 X 40	.....	39 X 31	42 X 37	50 X 44	60 X 40	45 X 35	40 X 40	37 X 30	46 X 38	40 X 36
19.	Canine	70 X 50	58 X 41	76 X 50	76 X 49	77 X 52	.....	60 X 40	67 X 50	74 X 46	80 X 50	55 X 40	70 X 48	68 X 40	70 X 43	71 X 40
20.	1st pm.	28 X 26	25 X 23	30 X 27	30 X 25	30 X 30	.....	23 X 22	27 X 25	33 X 32	30 X 27	20 X 10	26 X 26	20 X 10	30 X 25	25 X 22
21.	2nd pm.	63 X 46	53 X 43	67 X 50	69 X 50	70 X 50	.....	62 X 40	68 X 46	68 X 43	70 X 50	50 X 40	66 X 40	60 X 40	70 X 40	66 X 45
22.	3rd pm.	87 X 67	71 X 60	94 X 70	90 X 70	100 X 70	.....	80 X 52	93 X 63	100 X 73	100 X 70	72 X 60	90 X 60	75 X 61	100 X 67	90 X 60
23.	4th pm.	140 X 77	133 X 65	146 X 84	145 X 85	150 X 85	.....	117 X 70	142 X 85	160 X 87	150 X 85	130 X 85	120 X 77	110 X 66	150 X 90	130 X 85
24.	m.	20 X 10	.....	20 X 11	.....	.....	.....	50 X 21	51 X 21	.....	20 X 11	.....	55 X 23	49 X 30	55 X 25	50 X 30
25.	Length of mandible	665	648	710	685	720	.....	611	685	.....	750	615	660	530	730	640
26.	Length of condyle	170	168	173	160	180	.....	130	170	200	190	155	145	125	170	150
27.	Height at m.	170	174	164	160	170	.....	139	163	220	185	155	165	122	170	140
28.	Width at 2nd pm.	290	303	303	.....	300	.....	219	263	.....	315	291	235	210	263	240
29.	Width at diasteme .....	.....	.....	.....	.....	.....	.....	.....	250	.....	.....	.....	.....	.....	150	150
30.	Length of diasteme	39	42	37	35	45	.....	45	41	.....	45	35	50	40	50	40
31.	Length of symphysis	230	207	227	224	235	.....	191	206	.....	225	205	210	180	220	200
32.	Height of coronoid process .....	.....	.....	350	.....	.....	.....	.....	299	.....	.....	.....	.....	.....	315	281
33.	Incisor series	120	125	123	125	120	.....	120	113	.....	130	120	160	100	125	100
34.	Molar series	310	280	340	335	350	.....	268	309	352	240	260	222	250	320	300
35.	3rd incisor	32 X 30	.....	32 X 32	31 X 33	32 X 30	.....	24 X 22	26 X 26	40 X 30	35 X 35	30 X 30	25 X 25	21 X 21	30 X 25	25 X 20
36.	Canine	65 X 47	57 X 43	66 X 49	63 X 50	72 X 50	.....	54 X 41	72 X 50	71 X 52	75 X 50	55 X 40	60 X 40	50 X 40	75 X 50	70 X 45
37.	1st pm.	59 X 42	51 X 37	63 X 44	59 X 40	68 X 49	55 X 40	52 X 32	62 X 45	66 X 48	70 X 48	50 X 35	60 X 35	47 X 30	70 X 30	60 X 45
38.	2nd pm.	82 X 56	75 X 53	85 X 60	83 X 57	90 X 60	80 X 55	72 X 44	84 X 55	87 X 65	90 X 62	70 X 50	75 X 43	70 X 40	90 X 60	80 X 52
39.	3rd pm.	86 X 51	78 X 50	91 X 51	91 X 51	90 X 53	80 X 50	78 X 43	94 X 53	95 X 59	98 X 50	70 X 50	80 X 45	72 X 40	91 X 55	95 X 53
40.	m.	110 X 45	106 X 46	120 X 50	120 X 51	120 X 52	95 X 40	81 X 40	94 X 58	128 X 58	120 X 55	100 X 40	115 X 40	77 X 40	97 X 50	95 X 45
		I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	XV.

the cave-Hyena, especially as regards the upper and lower carnassials, and in the 1st premolar, is quite confirmatory of the opinion that they are but varieties of one and the same species. But the proper comparison of the other bones of the skeleton yet remains to be made before this opinion can be regarded as fully established.

A few words are requisite in order to explain why so many columns are devoted in Table V. to *H. crocuta*.

Column I. shows the mean dimensions deduced from every specimen of *H. crocuta* that has come under my observation, taken together; and it is given in order to afford, as nearly as the amount of materials would allow, the mean of all the variations to which that species is subject.

In Column II. the figures show, as I have explained in the latter part of the paper, what I take to be the important changes induced in this species of *Hyæna* in consequence of its unnaturally prolonged existence in a state of captivity from an early period of life; and in Column III. these amounts are contrasted with those taken from the mean dimensions in all the specimens of *H. crocuta* living in a state of nature, and embracing individuals considerably differing in size, though not, as will be observed, varying from the general mean of the species in all the more fixed and important points.

In Columns IV. and V. are contrasted the extremes observed by me in what would appear to be varieties (perhaps in some cases sexual?) of the wild Hyena. And I have done this also with the view of comparing, at some future time, this diversity in the existing *H. crocuta* with the even still greater diversities exhibited in its fossil representative.

N.B.—The numbers are all given in $\frac{1}{100}$ ths of an inch, and they, of course, are readily reduced to millimetres by multiplying them by 25.4 and dividing by 100. Those numbers to which an asterisk is added have been taken from only a single specimen in each instance.

DESCRIPTION OF PLATE.

Fig. 1.—Maxillary teeth of *H. brunnea*.

Fig. 2.—Mandibular teeth of *H. brunnea*.

Fig. 3.—Vertical view of cranium of *H. brunnea* (half size).

Fig. 4.—Occipital triangle of *H. brunnea* (half size).

Fig. 5.—Occipital triangle of *H. striata* (half size).

On the Longicornia of Australia, with a List of all the Described Species, &c. By FRANCIS P. PASCOE, F.L.S.; F.Z.S., &c., late Pres. Ent. Soc.

[Read June 21, 1866.]

A LIST of Australian Longicornia which I published about seven years ago, contained the names of 259 species. Through the kindness of many friends this number has now been brought up to nearly 500; but if we take into consideration the economy of these insects, their usually short lives in the perfect state, and their attachment to certain trees in which their larvæ have fed, confining their distribution in many cases to very narrow limits, we can scarcely avoid drawing the conclusion that we are still very far from having a complete list. However, it is I think desirable, in the dispersed condition of zoological literature, that we should now and then examine the materials that have been accumulated, and indicate where they are to be found; and this I have attempted to do in the following pages.

The boundaries of these austral lands, viewed as a zoological region solely in relation to the Coleoptera, seem to be strictly limited to Australia and Tasmania,—New Guinea, to the north, belonging to the Malay region, and very decidedly separated by Torres Straits; while New Caledonia and New Zealand, to the east, can be regarded as satellite regions only—that is, as containing a mixture of no very decidedly characteristic geographical genera with a few others strictly endemic and often of very remarkable structure.

If we take the Coleoptera as an order, then the Longicornia may be regarded as a suborder composed of the three families of *Lamiidæ*, *Cerambycidæ*, and *Prionidæ*. Each of these is divided into numerous subfamilies, from which we pass to the genera and species.

The Longicornia offer many difficulties in their classification. Many of the technical characters used for defining the genera do not amount to more than modifications, sometimes with almost insensible gradations between them; but genera, like species, are often differentiated by very slight characters only, and what is true of one is as true of the other. It is not, however, to be inferred that the genera themselves are in such cases so insensibly connected; it is the characters by which we attempt to indicate them. Occasionally, too, we find the generic characters merging into the specific; and yet the genus, in the sense of a group of

nearly connected species, is not thereby by any means invalidated. To meet the objections to such groups, it is sometimes proposed to call them "subgenera;" but the idea of overcoming such a difficulty by the alteration of a name seems to me to be a mere delusion. Well-defined genera require aberrant species to be eliminated; if the genera are to be enlarged to meet such cases, then the genera, as such, cease to have any definable limits, and can convey no certain idea to the mind. Having acted on the principle of the first proposition, it has appeared to me desirable to make these remarks in order to meet the objection of those who consider, not that the number of genera should be regulated by their practical utility, but that it should be limited so as to avoid the inconvenience of taxing the memory. It is, I think, a great point gained when the knowledge of one member of a genus enables us, with the aid of a short diagnosis, to form a good idea of another; and this can only be done by a careful avoidance of mixing incongruous species together into one genus. For this, many new genera will have to be propounded; and this practice appears unquestionably to be becoming more and more the tendency of modern systematists. It may, however, be carried too far, as when nearly allied species are separated solely on technical grounds—such separatists failing to see that what may be good generic characters in one case are only of specific importance in another.

In order to make this list as complete as possible, I have prefixed descriptions of the following new species. Some of them and a few other interesting forms, not hitherto figured, are represented in the two plates appended to this Catalogue.

HEBESECTIS SPARSA.

H. nigra; antennis annulatis; scapo modice elongato; prothorace supra glabro, utrinque niveo pubescente; elytris ovatis, bicarinatis, maculis niveis pubescentibus dispersis.

Hab. Western Australia.

Black; head broad in front, with little tufts of white hairs: antennæ rather larger than the body; the scape subelongate, obconic; the third and fourth joints, at the base, and the sixth and eighth, white: prothorax glabrous above, closely punctured, the sides covered with a dense snowy-white pubescence; scutellum small, rounded posteriorly: elytra ovate, rather coarsely punctured, covered with small white tufts of pubescence, each elytron with two rather strongly marked carinæ: body beneath with a tufted whitish pubescence; legs slightly pubescent. Length 4-7 lines.

This species has long stood in our collections as *Hebecerus sparsus*, Reiche, a name, I believe, never published. It is related to *H. Germari*, but, *inter alia*, it has a longer scape, and the prothorax has not the white stripe at the side.

NEISSA.

Caput antice transversum, tuberibus antenniferis brevibus. *Oculi* late emarginati. *Antennæ* sparse pilosæ, corpore longiores; *scapo* modice elongato, apicem versus sensim crassiore, articulo tertio quam scapus paulo brevior, quarto præcedenti æquali, cæteris gradatim decrescens. *Prothorax* capite vix latior, quadratus, utrinque abrupte spinosus. *Elytra* oblonga, basi cristata, lateraliter deflexa, apice integra. *Pedes* subbreves, æquales. *Pro-* et *mesosterna* simplicia.

A small species, resembling *Pentacosmia scoparia* in habit and colour, is the type of this genus. From *Pentacosmia*, however, it differs in its quadrate prothorax, basal crests of the elytra, antennæ with the third joint not longer than the scape, the fourth equal to the preceding, and the remainder gradually diminishing in length. *Illæna*, Er., is probably nearly allied to this genus; but he describes the prothorax as only slightly nodose at the sides. The other characters given by Erichson are very general; but he compares it to *Anæsthetis* and *Deroplia* (*Stenidea*). Of the second species I have seen only a single example. Both species I owe to Mr. Odewahn.

NEISSA INCONSPICUA.

N. fusca, sparse albo pilosa; elytris obscure pallido variis.

Hab. South Australia (Gawler).

Brown, clothed with more or less erect whitish hairs; the elytra faintly marked with indistinct palish patches; head and prothorax closely punctured, the lateral spine of the latter very slender even at the base; scutellum triangular; elytra subseriate-punctate, obliquely depressed outside the basal crest, the side abruptly bent down, the angle there formed not prominent, towards the apex a short, slightly elevated line; body beneath, legs, and antennæ rufous brown, sparingly pilose. Length 2 lines.

NEISSA NIGRINA.

N. subdepressa, nigra, pube brevi concolore et pilis dispersis albidis tecta; antennis scapo, articulis tertio et quarto longioribus.

Hab. South Australia (Gawler).

In most of its characters closely agreeing with the preceding, but in size and colour apparently very distinct; the pubescence is also shorter, and, to the naked eye, is nearly uniformly black; the scape and third and fourth joints of the antennæ are relatively longer, and the legs are

proportionally larger; above, all the body and especially the elytra are decidedly depressed. Length $3\frac{1}{2}$ lines.

BUCYNTHIA.

Caput antice quadratum. *Oculi* parvi, remoti. *Antennæ* graciles, fimbriatæ, basi distantes; scapo modice elongato, apice subproducto, obsolete cicatricoso; articulo tertio multo longiore, sequentibus gradatim brevioribus. *Prothorax* transversus, lateribus minute dentatus. *Elytra* subdepressa, ovata, prothorace valde latiora. *Pedes* mediocres, fere æquales: *tarsi* parvi. *Prosternum* simplex. *Mesosternum* elevatum, antice subdentatum.

The only species constituting this genus was originally referred by me to *Zygocera*, with some of whose members, as the genus then stood, it has a considerable resemblance in form and colour. The widely separated antennæ at the base, however, show that it should be referred to the *Mesosinæ* rather than to the *Hypsoluminæ*, to which I consider *Zygocera* belongs. The type is *Bucynthia spilopectera*, Pasc. (*Zygocera*).

SYMPHYLETES DEVOTUS.

S. subangustus, ferrugineus, pube brevi, densa, subsericea tectus; prothorace subtransverso, antice paulo constricto, ad latera irregulariter rotundato, disco tuberculis quatuor parvis instructo; elytris subparallelis, apice subtruncatis, basi leviter tuberculato-cristatis, pone medium plaga irregulari obliqua alba; tibiis quam tarsi brevioribus.

Hab. Western Australia (Perth) (*Mr. Duboulay*).

Rather narrow, ferruginous, covered with a short, dense, somewhat silky, greyish pile; head rather narrow in front, median line glossy black and very distinct; prothorax subtransverse, a little narrower anteriorly, the sides irregularly rounded, the disk with two transverse tubercles, behind these two others not quite so prominent; scutellum scutiform; elytra subparallel at the sides, the base broader, with two or three black shining tubercles on each, the apex rounded, behind the shoulder, at the side, a pale patch, which is nearly connected with a broad oblique irregular band behind the middle; body beneath with a long, greyish, silky pile; legs and antennæ closely pubescent, greyish, tinged with brownish yellow. Length 9 lines.

The pubescence is more silky than is usually met with in this genus; the species is otherwise very distinct, although, from its general appearance, it may be placed with *S. munitus*, *S. sodalis*, *S. ingestus*, and others.

SYMPHYLETES DUBOULAYI.

S. cylindricus, pube cinerea maculis numerosis fulvis adspersa tectus; prothorace cylindrico; elytris parallelis, basi haud cristatis, apice ro-

tundatis, granulis nigris nitidis numerosis instructis, ad latera plaga oblonga nivea ornatis.

Hab. Western Australia (Perth) (*Mr. Duboulay*).

Cylindrical, ferruginous, covered with a close short ashy pile spotted with fulvous; head rather broad and flattish in front, the pubescence ochraceous, especially round the eye, the median line black and well marked; prothorax cylindrical, with transverse interrupted lines of fulvous; scutellum rather large, subscutiform; elytra elongate, with nearly parallel sides, the apex rounded, a few black granules at the base, and several smaller ones along the suture, but more ferruginous, a snowy oblong patch on the external margin, the rest of the elytra with numerous small fulvous spots on an ashy ground; body beneath with a long ashy pubescence; the edges of the abdominal segments and spots on the sides of the sterna fulvous; legs with a whitish pubescence, spotted and clouded with fulvous; antennæ ferruginous, slightly pubescent, spotted with white. Length 9 lines.

A very distinct species, with longer and more parallel elytra than any other that I am acquainted with, and remarkable for the uniform distribution of its colours, with the exception of the snowy patch along the side.

SYMPHYLETES SUBMINIATUS.

S. ferrugineus, rufescente varius; elytris subtrigonatis, basi spinuliferis, apice truncatis, margine exteriore apiculatis.

Hab. Western Australia (Perth) (*Mr. Duboulay*).

Ferruginous, with a sparse greyish pile varied with patches of rufous or reddish orange, short, closely set hairs; head orange in front, and thinly punctured, the vertex ferruginous; prothorax slightly transverse, subquadrate, the sides very slightly rounded, the disk with two small central tubercles, sparsely punctured, ferruginous in the centre, orange at the sides; scutellum transversely scutiform; elytra subtrigonate, rather finely punctured, with orange patches at the base, along the suture, and on the sides, the base with a few small triangular spines, the apex truncate, its exterior margin on each side produced into a close mucro; body beneath along the middle and the abdomen covered with long ashy hairs; the breast at the sides orange; legs ferruginous, tibiæ scarcely as long as their tarsi; antennæ ferruginous, varied with a pale pile. Length 7 lines.

This very distinct species may, for the present, stand after *S. fulvescens*, Pasc.

SYMPHYLETES ILIACUS.

S. subangustus, viridi-olivaceus, plus minusve denudatus; elytris basi granuliferis, apice truncatis, ad latera niveis.

Hab. Western Australia (Champion Bay) (*Mr. Duboulay*).

Rather narrow, dark olive-green, shining and for the most part without

any or with very little pubescence; head with a white pubescence, principally about the eyes, and with a few long white hairs; prothorax oblong, nearly cylindrical, rugose, with widely scattered hairs, the disk with two slight tubercles; scutellum scutiform; elytra narrowly subtrigonal, with a few large, mostly conical, granules at the base, the apex truncate, the disk more coarsely punctured at the base, where also is a sparse greyish pile, a densely pubescent snowy patch from the shoulder, gradually lessening towards the apex; body beneath and legs with a sparse whitish pile; fore tibiae curved, middle and posterior rather shorter than their tarsi; antennae with a thin whitish pubescence, and clothed with long hairs beneath. Length 6 lines.

Also a very distinct species, which may stand after *S. variolosus*, Pasc.

SYMPHYLETES SIMIUS.

S. ferrugineus, nitidus, fere denudatus; elytris subtrigonalis, basi spinuliferis, apice truncatis, ad latera antice plaga pubescenti-fulva.

Hab. Western Australia (Champion Bay) (*Mr. Duboulay*).

Ferruginous, shining; head rather strongly punctured in front, the median line not reaching to the mouth; prothorax nearly subquadrate, irregularly punctured, with two tubercles on the disk; scutellum subscutiform, rounded posteriorly; elytra subtrigonal, rather closely punctured, with a few scattered concolorous granules, one or two spiniform, at the base, the apex truncate, an oblong orange patch at the side near the shoulder; body beneath with a long whitish pubescence; the breast orange at the sides; legs with a few scant whitish hairs, more numerous at the tips of the tibiae; antennae nearly naked, a few whitish hairs fringing the lower edge. Length 7 lines.

Near *S. egenus*, but with truncate elytra like *S. degasus*, without, however, the snowy stripe on the side.

SYMPHYLETES BATHURSTII.

S. ferrugineus, pube tenuissima grisea tectus; prothorace oblongo, subcylindrico; elytris subtrigonalis, modice punctatis, basi leviter granuliferis, apice truncatis, margine exteriore dense niveo pubescente.

Hab. South Australia (Gawler) (*Mr. Bathurst*).

Ferruginous, with a thin scaly greyish pubescence, and minute patches of fulvous; head with a close whitish pubescence in front, and three fulvous stripes on the vertex; prothorax oblong, nearly cylindrical, the disk with two small central tubercles; scutellum rather transverse, depressed in the middle; elytra subtrigonal, rather thinly punctured, a few concolorous granules principally at the base, the apex truncate, a white densely pubescent band along the side externally; body beneath with a long greyish (on the abdomen yellowish) pile; legs and antennae with a greyish pile; the latter fimbriated beneath. Length 8 lines.

Differs from *S. derasus* chiefly in pubescence; there are also a few minor differences, such as the broader head, more convex in front and much less depressed between the antennæ, the longer prothorax, &c. A good series of specimens might show that they belong to one species.

RHYTIPHORA ODEWAHNII.

R. nigra, pube opaca interrupta flavescente tecta; elytris conferte flavescente maculatis, apice truncatis; antennis albo annulatis.

Hab. South Australia (Gawler).

Black; pubescence opaque, pale yellowish, interrupted; head with two pubescent stripes on the occiput, a vertical stripe behind the eye, the face with irregular patches; prothorax very short, having four or five narrow bands; scutellum semicircular; elytra not granulate at the base, covered with closely set pubescent spots (often confluent) of pale yellowish, the intervals very slightly pubescent, showing the black derm beneath; body beneath with a whitish pubescence, spotted with brown; legs closely pubescent; antennæ black, the basal half from the third to the tenth joints ashy white. Length 9 lines.

A very distinct species, and at once differentiated by the closely set spotted pubescence on the elytra. I have dedicated it to Mr. Odewahn, from whom my example was derived.

RHYTIPHORA SEMIVESTITA.

R. castanea, subtiliter pubescens; prothorace fasciis angustatis, elytris maculis indistinctis ochraceis ornatis, his postice plagis duabus glabris; antennis griseo maculatis.

Hab. Western Australia (Perth).

Chestnut-brown; pubescence very thin, greyish, with linear bands on the prothorax and spots on the elytra ochraceous; head and basal joint of the antennæ nearly glabrous; prothorax transverse; elytra with numerous granules, extending to behind the middle, and of the same colour as the derm, posteriorly on each side a large glabrous patch; rest of the elytra with a mixture of pale greyish and small ochraceous spots; body beneath and legs reddish chestnut, nearly glabrous, except a few spots on the sides, borders of the abdominal segments, and lower part of the tibiæ and tarsi; antennæ slightly pubescent, except at the base, spotted with greyish. Length 12 lines.

Also very distinct.

MICROTRAGUS STICTICUS.

M. cinereo pubescens, omnino nigro setulosus; prothorace rude punctato; elytris angustatis, maculis nigris elevatis dispersis.

Hab. —.

Pubescence pale ashy, very dense and short; in other respects resem-

bling *M. arachne*, but the prothorax less rugosely punctured, and the black spots on the elytra composed of stiff erect hairs, more decidedly raised above the surrounding pubescence. Additional specimens may probably show that this is only a variety; but the difference in colour is very marked. Length 7 lines.

ATHEMISTUS ARMITAGEI.

A. brunneus, tenuiter, griseo pubescens; prothorace antice angustiore, lateraliter dente minuto instructo, disco haud tuberculato; elytris elliptico-ovatis, in medio quam prothorax latioribus.

Hab. Sydney.

Reddish brown, with a very fine greyish pubescence; head thinly punctured, a little convex in front; prothorax broader than the head, very sparsely but rather more coarsely punctured, narrowed anteriorly, rounded at the sides, and behind the middle furnished with a very small but distinct tooth; scutellum triangular, very indistinct; elytra scarcely broader than the prothorax at the base, gradually increasing to the middle, then more rapidly rounded to the apex, the disk with very closely arranged rows of small tubercles, which towards the apex are replaced by large deeply impressed punctures, the apex of each elytron rounded; antennæ, body beneath, and legs brown, thinly pubescent; tibiæ with yellowish hairs at the tip; antennæ rather more than half the length of the body. Length $3\frac{1}{2}$ lines.

Smaller and stouter than *A. rugosulus*, Guér., and well distinguished by the characters of the prothorax, elytra, &c. I have named it after Edward Armitage, Esq., A.R.A., who kindly presented me this and the following species, although uniques in his collection.

ATHEMISTUS FUNEREUS.

A. ater, obsolete pubescens; prothorace antice paulo angustiore, lateraliter dente minuto instructo; elytris oblongo-ovatis, quam prothorax vix latioribus.

Hab. Sydney.

Black, with only very faint traces of pubescence; head finely punctured; prothorax broader than the head, coarsely and rather closely punctured, somewhat narrower anteriorly, rounded at the sides, with a very small but distinct tooth; scutellum very small and indistinct; elytra oblong-ovate, scarcely broader than the prothorax in any part, slightly rounded at the sides, the apex of each rounded, the disk with very closely arranged rows of small tubercles; antennæ, body beneath, and legs reddish brown; the tips of the tibiæ with yellowish hairs; antennæ about two-thirds the length of the body. Length $3\frac{1}{2}$ lines.

Distinguished from the last by its larger and more coarsely punctured prothorax, narrower and more parallel elytra, and its black colour, with an almost obsolete pubescence.

HATHLIODES.

Mycerino affinis sed differt præcipue *prosterno* simplici, haud antice producto.

In *Mycerinus dorcadoides*, Serv., the prosternum is raised, produced, and transversely expanded in front, and, the propectus being reduced to a mere line, the head, or rather the under surface of the oral organs, rests against it. To this genus, which originally received the name of *Hathlia* from Dejean, but which was first described by M. J. Thomson*, several species have been referred by Hope, Blanchard, Guérin, and myself; they all differ, however, in the very important structural character mentioned above, and they also differ considerably among themselves. With the exception of one species, which will be referred to presently, I propose, notwithstanding, to retain all the Australian species in this genus. Nevertheless it might have been thought desirable to distinguish between those species with a fusiform outline, like *Hathliodes grammicus*, and those with the humeral angles of the elytra projecting beyond the base of the prothorax, like *H. quadrimaculatus*; but then this character not only varies in degree in the species, but it also varies to a certain extent in individuals, as in *H. aridus*. M. J. Thomson formed his genus *Mycerinopsis* on the latter, chiefly on account of its longer antennæ; but its affinity to *H. quadrilineatus*†, Hope, is, I think, too close to allow of its separation. *H. lineellus* is a somewhat degraded form of the genus; while *Hathlia gracilis* and *H. procera*, the latter a Ceylon species, are altogether aberrant‡. The following species, which

* This is not quite correct, M. Guérin-Ménéville having pointed out in his 'Iconographie' (p. 428), but in an irregular sort of way, the characters which distinguish *Hathlia* (or *Hattlia*, as it was there spelt) from *Apomecyna*, to which it had been united by Serville.

† This is a variable species, black to greyish ochreous, with pale or whitish lines, some of which are occasionally obsolete.

‡ *Hathlia Buckleyi*, Pasc. (Trans. Ent. Soc. ser. 2. iv. p. 107), I propose to separate from all the above; its genus I may briefly characterize here:—

MARMYLARIS.

Caput magnum. *Antennæ* corpore paulo longiores, articulo quarto tertio fere æquali, cæteris brevioribus. *Prothorax* capite haud latior, transversus, cylindricus. *Elytra* valde convexa, parallela, prothorace vix latiora. *Pedes* validi. *Pro- et mesosterna* ut in *Lychrosi*.

A narrower and more convex form than any of the preceding, with larger head, &c. *M. Buckleyi* is a peculiar species, white, the elytra covered with numerous very distinct black spots; it is from India. M. J. Thomson's *Mycerinus varipennis* appears to be referable to this species.

has not been described hitherto, is allied to *H. grammicus*; both are in the collection of the British Museum, and were received from an officer of a surveying-ship, but without any precise locality; they are supposed to be from the north or north-west coast.

HATHLIODES MORATUS.

H. supra pallide griseo pubescens, lateribus albidis; elytris basi prothorace vix latoribus, oblique striatis, postice dehiscentibus, apice singulorum angulato.

Hab. North coast?

Densely pubescent, pale greyish above, whiter at the sides, irregularly punctured; head nearly as broad as the prothorax; the latter rather longer than broad; the elytra at the base scarcely broader than the prothorax, obliquely striated, dehiscent posteriorly, each apex ending in a somewhat acute angle; body beneath, legs, and antennæ covered with a dense whitish pubescence. Length $6\frac{1}{4}$ lines.

LYCHROSIS.

Caput antice paulo rotundatum. *Oculi* parvi. *Antennæ* basi remotæ, corpore breviores, scapo subelongato, cylindrico, articulo tertio multo longiore, quarto præcedente brevior, sequentibus multo brevioribus. *Mandibulæ* validæ. *Prothorax* lateribus rotundatus. *Elytra* convexa, subcylindrica. *Pedes* æquales. *Coxæ* anticæ magnæ, eductæ. *Prosternum* haud productum, antice angustius.

The type of this genus (*Mycerinus luctuosus*) appears to me to be so distinct in habit as to make it desirable to separate it from the other species, notwithstanding the differences which prevail among them. The most obvious peculiarities of the genus are the rounded sides of the prothorax, contracted therefore at the base, the more convex elytra, and the larger anterior coxæ. These characters might have been made more trenchant, but that I have left them sufficiently open in order to include *Hathlia zebrina*, Pasc., an Indian species which it is scarcely desirable to separate generically at present.

PRAONETHA PLEURICAUSTA.

P. fusca, rude pubescens; prothorace subquadrato; elytris breviusculis, carinulatis, postice abrupte declivibus, basi piloso cristatis, apice truncatis, lateribus obscure fusco plagiatis; antennis concoloribus.

Hab. Port Albany (north coast).

Covered with a rough pale-brownish pubescence; head impunctate; prothorax subquadrate, scarcely broader than the head, the sides almost parallel; elytra compressed, rather short, abruptly declivous posteriorly, the apex truncate, each elytron with three or four elevated

lines on each side, the innermost with three slightly pilose crests; at the base, middle, and apex, and towards the outer margin a large dull brownish patch; body beneath and legs brown, partially pubescent; antennæ shorter than the body, brownish. Length $4\frac{1}{2}$ lines.

This is the second Australian species of a large genus which abounds in the Malay archipelago and is found as far north as Japan. It should be placed near *P. propinqua* and *P. iliaca* from Borneo.

SYBRA CENTURIO.

S. fusca, nitida, lateribus griseo pubescentibus; elytris subelongatis, singulis biseriatim griseo guttulatis, apicibus productis, anguste acutis, dehiscentibus.

Hab. New South Wales.

Dark brown, shining; the sides more or less densely covered with a greyish pubescence, which takes the form of stripes above and below the eye and on the prothorax, but which are less definite on the elytra, and are accompanied by two rows of small greyish spots, the outer extending from the shoulder nearly to the apex, the inner row, between the suture and stripe, composed of about five or six distinct spots; head loosely pubescent in front; middle of the disk of the prothorax nearly glabrous, sparingly punctured; scutellum semicircular; elytra very slightly pubescent, except at the sides, the punctures subseriately arranged and confined to the basal half; body beneath brown, shining, speckled with a greyish pubescence; legs and antennæ brown, slightly pubescent, the latter ringed with ashy. Length 6 lines.

This well-marked species belongs to the second of the artificial sections proposed by me in 'Long. Malay.' (p. 214), into which a part of the extensive genus *Sybra* was located. The only other Australian species of this section (*S. acuta*) is less related to the above than some of the Malayan species—*S. pulvereæ* for example.

ESSISUS.

Caput haud elongatum; fronte quadrata, convexa, infera, subhorizontali, apice producto; tuberibus antenniferis validis, subparallelis. *Oculi* haud divisi, mediocres. *Palpi* maxillares acuti. *Antennæ* 11-articulatæ, fimbriatæ, corpore paulo longiores (♂), vel breviores (♀); *scapo* cylindrico, modice elongato, piloso; articulo secundo breviter obconico; tertio scapo longiore; quarto tertio æquali, apice infra plumoso; articulis sequentibus multo brevioribus. *Prothorax* cylindricus, capite haud latior. *Elytra* breviuscula, angustata, parallela, apicibus rotundatis. *Pedes* brevissimi, æquales; *femora* incrassata; *tarsi* art. penultimo profunde diviso, ultimo medioeri. *Pro- et mesosterna* simplicia.

The subfamily *Hippopsinæ*, to which this genus belongs, has

not been hitherto represented in Australia, although at least two genera occur in New Guinea, and others in the Malay region, as well as in Africa and America. The present genus, however, has very little affinity to either of these, but in habit more nearly resembles *Pentacosmia*, which is also Australian, although belonging to quite a different group. Of the two specimens before me, one (a male) is very much smaller, with longer antennæ, and the last seven joints, when taken together, quite as long as the preceding four; while in the female the first four are half as long again as the seven following. The species appears to vary as to depth of colour and amount of greyish marking.

ESSISUS DISPAR.

E. brunneus, griseo varius, plumis antennarum nigris.

Hab. Queensland.

Reddish brown; the head and prothorax darker, sparingly pilose, and coarsely punctured above; sides of the prothorax and sides and posterior part of the elytra covered with a greyish pubescence; antennæ reddish brown, the plume on the fourth joint dark brown or black; body beneath brownish, with a sparse grey pubescence. Length 2-3½ lines.

AGAPETE VESTITA.

A. nigrescens; capite prothoraceque, macula magna laterali excepta, rufo-fulvis, crebre et subtiliter punctulatis.

Hab. South Australia (Gawler).

Head and prothorax of equal breadth, reddish fulvous, except a large black spot on the side of the latter, minutely and finely punctured, slightly pubescent, and having also a few short erect black hairs; scutellum dark brown; elytra obscure greyish, extending to the end of the first abdominal segment; sterna and abdomen black, the sides of the former with a coarse whitish pubescence; legs black; antennæ brownish. Length 6 lines.

This species has longer elytra than either *A. carissima* or *Kruesleræ*; from the former, with which it agrees most in colour, it is distinguished by the narrower outline of the prothorax nearly parallel at the sides, and its (and the head's) minute and closely set puncturation.

EARINIS KRUESLERÆ.

E. nigra; capite, frontee xcepta, prothoraceque hoc flavis, basi punctato; elytris circa scutellum, et fasciis duabus, una ante medium interrupta, flavis; antennis concoloribus.

Hab. South Australia (Gawler).

Black, with scattered erect hairs; head yellow, space between the eyes black; prothorax yellow, the anterior border not raised as in *E. mi-*

mula, the base punctured, as well as the disk; scutellum small, black; elytra black, the apices more pointed than in *E. mimula*, space round the scutellum, band before the middle, but interrupted at the suture, and another band between the middle and apex, yellow; body beneath, except the sterna, dull yellowish, the abdomen darker; legs black; antennæ entirely black. Length 5 lines.

I have great pleasure in dedicating this beautiful little Longicorn to Mrs. Kruesler, of Gawler, to whom I have been indebted for so many interesting novelties.

APOSITES PUBICOLLIS.

A. rufo-brunneus; prothorace pone apicem constricto, lateribus et basi griseo pubescentibus; elytris confertim punctatis.

Hab. Western Australia.

Head and prothorax pitchy brown, covered, except on the disk of the latter, with a coarse whitish or greyish pubescence; elytra nearly glabrous, reddish brown, each with four raised longitudinal lines, the intervals closely and rather finely punctured; the apex spinose at the suture; body beneath with a close grey pubescence; legs dark reddish brown; the tarsi paler; antennæ pale reddish brown, about a third longer than the body, the third and fourth joints not dilated; prothorax broadly constricted behind the apex, the middle part swelling out into an obtuse prominence; anterior coxæ strongly exerted, their acetabula broadly angulated externally. Length 13 lines.

In this species the anterior coxæ are quite conical, and the angles of their acetabula considerably larger than in *A. macilentus*; the prothorax is also constricted anteriorly, and the abdomen does not extend beyond the elytra. In these respects, and in the cylindrical third and fourth antennary joints, this species rather recedes from the type; the latter character, however, may be only sexual. The habit of the two species is almost identical. In the British Museum.

URACANTHUS SIMULANS.

U. griseo pubescens, plaga triangulari fusca nitida pone humeros, apice elytrorum singulorum extus rotundato, dein tenuiter sinuato, sutura in spinam exeunte.

Hab. South Australia.

Entirely covered with a uniform greyish pubescence, except a triangular glossy brown patch behind the shoulder, but the patch smaller and not bordered with a densely pubescent line as in *U. triangularis*; elytra shorter than in that species, and with their apices pubescent; prothorax slightly angulated on each side in the middle; body beneath and legs closely pubescent; antennæ with a finer pubescence. Length 10-11 lines.

It will be seen from the diagnosis that the form of the apices of the elytra is very different from that of *U. triangularis*, to which it bears a close resemblance.

URACANTHUS MINIATUS.

U. supra ferrugineus, pube miniata tectus; abdomine, antennis pedibusque nigris; apicibus elytrorum rotundatis.

Hab. Western Australia.

Ferruginous above, covered with a coarse yellowish-red pubescence; abdomen, legs, and antennæ black, with a very slight pale-greyish pubescence; sterna reddish; head slightly punctured; clypeus strongly marked; posterior half of the prothorax much broader than the anterior, elytra a little incurved at the sides, the apices rounded; eyes smaller than in other species of the genus, and considerably less approximate beneath; antennæ not reaching to the end of the elytra; mandibles and palpi brownish, the former irregularly punctured. Length 8 lines.

A slightly aberrant form of the genus, owing to its colour and smaller eyes. The specimen in the British Museum, the only one I have seen, is probably a female.

OMOPHÆNA TENIATA.

O. nigra, confertim punctata; elytris singulis lineis duabus subelevatis et vitta aurantiaca ornatis; antennis nigris, articulis 4^{to}, 5^{to}, et 6^{to} dimidio basali, albis.

Hab. —.

Black, slightly nitid, with numerous slender erect hairs on the upper parts and legs; a bright orange stripe running from the shoulder to the apex; head and prothorax closely punctured, the latter broader than the head, narrower at the base, the sides somewhat parallel, the disk with three almost obsolete tubercles; elytra scarcely broader than the prothorax, the sides parallel, two indistinct elevated lines on each; body beneath black, the abdomen brownish, shining; legs and antennæ black, the fourth, fifth, and sixth joints of the latter with their basal halves white. Length 4 lines.

Omophœna is distinguished from its allies by its 10-jointed antennæ. The type (*O. Kruesleræ*) differs from the present more particularly in the form of its prothorax, which is narrower, and more rounded at the sides, and in the absence of any raised lines on the elytra. In the British Museum.

SIDIS.

Caput triangulare. Oculi magni, reniformes, supra distantes. Antennæ breves, basi remotæ, scapo basin versus attenuato et curvato, articulo

tertio brevior, cæteris cum tertio æqualibus. *Palpi* breves, triangulares. *Prothorax* elongatus, medio lateraliter nodoso-rotundatus. *Elytra* depressa, elongata, parallela. *Coxæ* anticæ globosæ. *Pedes* breves; *femora* incrassata; *tibiæ* sublineares; *tarsi* attenuati, breves. *Corpus* breviter setosum.

Differs from the above and other nearly allied genera in its shorter antennæ, the basal joint of which is, notwithstanding, longer than any of the others, and its shorter legs. The species described below has its whole upper surface clothed with minute setaceous hairs. In colour and general appearance it bears a certain resemblance to *Opilus mollis*.

SIDIS OPILOIDES.

S. testacea; capite prothorace rufo-brunneis; elytris pone medium castaneis.

Hab. South Australia (*Mr. Odewahn*).

Testaceous, covered above with short setaceous hairs; head and prothorax reddish, very coarsely and closely punctured; scutellum rather large, ovato-triangular; elytra, especially at the base, covered with large deep punctures, on the posterior third, which is of a chestnut-brown colour, they are much smaller and shallower, and less crowded, the anterior testaceous portion is also in its middle a little clouded with chestnut; body beneath testaceous; the abdomen inclining to brown; legs also testaceous, the tibiæ and tarsi darker; antennæ reddish testaceous, a little more than half the length of the body. Length 3 lines.

ACYRUSA.

Caput antice breviter triangulare, pone oculos vix constrictum. *Oculi* magni, reniformes, supra distantes. *Antennæ* sublineares; scapo brevi, basi curvato et attenuato; articulo tertio longiore, apice spinoso; sequentibus brevioribus et æqualibus. *Palpi* breves, obtusi. *Prothorax* elongatus, inæqualis, medio lateraliter nodosus. *Elytra* depressa, parallela, apice rotundata. *Coxæ* anticæ globosæ. *Femora* elongato-clavata; *tibiæ* graciles; *tarsi* attenuati, breves, postici longiores. *Corpus* setosum.

The type of this genus, *Obrium ciliatum*, was described by me in the 'Ent. Trans.' ser. 3. vol. i. p. 559; at the same time I expressed an opinion that this and other species also referred to that genus, would have eventually to be separated. But the question occurs, What is the importance to be attached to the spine at the apex of the third antennary joint? Like all the other characters of the Longicornia, it is, as it appears to me to be, a question of experience, to be answered according to the weight we attach to

other characters, which will or ought to decide the general affinities of the species in question. If we leave *Acyrua* in the neighbourhood of *Obrium**, how is *Phoracantha* (some of the species of which approach it very nearly in their characters) to be distinguished?

IGENIA.

Characteres ut in *Obrio*, sed *coxæ* anticæ globosæ, haud eductæ.

Proposed for the reception of *Obrium ibidionoides*, Pasc. (Trans. Ent. Soc. ser. 2. v. p. 26). To this I would add *Obrium dorsale*, Pasc. (Journ. of Entom. ii. p. 237). Between the two, but more intimately allied to the latter, is the following new species (it may be thought that the radical difference in the anterior *coxæ* shows that this genus has nothing whatever to do with *Obrium*):—

IGENIA STIGMOSA.

I. luteo-testacea; capite, fascia lata postica et lineis duabus ante medium elytrorum castaneis.

Hab. South Australia (*Mr. Odewahn*).

Yellowish testaceous: the head, a broad band near the apex of the elytra, and an oblong dash on each side between the band and the base, brownish chestnut; head coarsely punctured in front, and forming between the eyes longitudinal ridges; prothorax about half as long again as broad, nodose at the sides, irregularly punctured, the punctures leaving about five smooth spaces on the disk; scutellum triangular; elytra rather narrow, subseriate-punctate, the punctures coarse, but becoming gradually less so posteriorly, behind the middle a broad chestnut band, not touching the apex; body beneath luteous, shining; band between the eyes (beneath) and last four abdominal segments chestnut; legs luteous, the tips of the tibiæ and tarsi darker; antennæ dusky luteous, the third joint longer than either the scape or the fourth joint†. Length $4\frac{1}{2}$ lines.

SISYRIUM.

Caput antice breve. *Oculi* magni, reniformes, supra modice distantes.

Antennæ longitudine corpori æquales; articulo tertio quam scapus longiore, mutico; articulis ultimis vix compressis. *Prothorax* oblongus, capite lator, lateraliter irregularis. *Elytra* parallela, apice rotundata. *Pedes* mediocres, postici longiores; *tarsi* breves; *acetabula* antica cicatricosa, vix angulata.

* *Obrium* now contains only the three European species *cantharinum*, L., *brunneum*, Fab., and *bicolor*, Kraatz, the North-American *O. maculatum*, and probably a few others from the United States.

† In *I. ibidionoides* it is longer than the fourth, but shorter than the scape; in *I. dorsalis* it is a trifle shorter than either.

This genus scarcely differs from the former; and, on the other hand, it is not to be distinguished from some of the smaller aberrant species of *Phoracantha*, except for the absence of the spine on the third joint of the antennæ, and the more cylindrical form of their terminal joints. The type is *Sisyrrium tripartitum*, Pasc. (*Obrium*) (Journ. of Entom. ii. p. 238).

PHALOTA COLLARIS.

P. fusca, subnitida, disperse pubescens, capite nigro; prothorace luteo.

Hab. South Australia (*Mr. Odewahn*).

Dark brown, approaching to black, with a very scanty pubescence composed of small whitish erect hairs; head black; prothorax and breast yellow; scutellum black, subscutiform, rounded behind; elytra depressed, twice as broad as the prothorax at the base, thickly punctured, the apex of each rounded; body beneath (except the breast), legs, and antennæ glossy brown. Length 3 lines.

A broader insect than *Phalota tenella*, and at once distinguished by its black head. The characters of the genus in the above work were drawn up from a female, but the figure given was from a male. In the latter it will be seen that the fifth and succeeding antennary joints are much longer than the third and fourth; and therefore the term subequal, applied to them, requires modification. *P. collaris* is described from a female; doubtless the male will be found to have also longer antennæ.

XYSTENA.

Caput pone oculos constrictum et elongatum; *fronte* subverticali, *turgida*; *mandibulis* parvis. *Oculi* remote divisi, parte superiore supra distantes. *Antennæ* remotæ, lineares, setuliferæ, articulo basali subelongato, curvato, apicem versus sensim incrassato, tertio et quarto brevioribus, cæteris paulo longioribus et subæqualibus, vel parum decrescentibus. *Palpi* modice elongati, articulo ultimo obconico. *Prothorax* antice et postice constrictus, medio lateraliter nodosus. *Elytra* elongata, depressa, parallela. *Pedes* breves; *femora* modice incrassata; *tarsi* graciles, articulo basali elongato; *coxæ* anticæ elongatæ, contiguæ; *acetabula* antica valde extus angulata. *Mesosternum* depressum.

Allied to *Phalota*, especially in the remarkable character of the head (longer and more constricted, however, behind the eyes), in the different form of the prothorax, in the lengthened basal joint of the tarsi, and in the largely angular anterior acetabula. With regard to the latter character, I am afraid too much stress has been laid on it. M. J. Thomson, in his 'Systema,' divides his

"*Cerambycitæ*" into two subtribes—those with the anterior acetabula rounded, and those with them angulated externally; but, in fact, it is little more than a question of degree; and his "groupe" (not "cohorte" or "sous-tribu") "*Cerambycitæ veræ*," belonging to his second subtribe, has them only slightly (paulo) angulated externally, in which case it is not to be distinguished, so far as this character is concerned, from those in his first subtribe "*Callichromitæ*," in which it varies from a closed slit or cicatrix slightly open at its commencement and therefore forming a little angle, to the whole side of the acetabulum prolonged into a large angle, as in *Tragocerus* and other genera. In fact, M. Léon Fairmaire, notwithstanding the numerous divisions which he has formed for the European Longicorns, only places *Callichroma* and *Cerambyx* in the same "groupe," while in M. Thomson's 'Systema' they represent respectively the two great subtribes mentioned above.

XYSTÆNA VITTATA.

X. fusco-testacea; elytris albescentibus, sutura et linea longitudinali exceptis.

Hab. Queensland.

Brownish-testaceous, sparsely clothed with pale, delicate, erect hairs; head finely and closely punctured, a deeply impressed line in front; prothorax also finely punctured, longer than broad, its disk with two oblong, slightly nitid gibbosities; scutellum subquadrate; elytra very pale yellowish white, shining as if varnished, minutely and irregularly punctured, the suture and stripe on each elytron (neither quite extending to the apex) brownish testaceous; body beneath and legs glossy luteous brown. Length 4 lines.

BETHELIUM.

Caput antice brevissimum, tuberibus antenniferis fere obsoletis. *Oculi* lunulati, mediocres, grosse granulati. *Antennæ* corpori æquales vel longiores, lineares, basi distantes, scapo obconico, articulo tertio æquali, quarto abbreviato, sequentibus quam præcedentes longioribus. *Prothorax* oblongus, basi angustior, ad latera rotundatus, disco æquali. *Elytra* parallela. *Coxæ* anticæ globosæ. *Acetabula* antica breviter angulata. *Pedes* mediocres; *femora* clavata. *Pro-* et *mesosterna* elevata. *Corpus* depressum.

The type of this genus was originally described by Mr. Newman without any generic name, and with the specific one of "*signiferum*;" at the same time he indicated it as being a "G. n. *Callidio* affine." In the same genus he also placed "— *piceum*," which, however, was an old Fabrician species, and is now known as the *Callidiopsis scutellaris*. *Bethelium* is distinguished from the

greater part of the genera of this subfamily by the form of the prothorax. My *Callidium inscriptum* belongs also to *Bethelium*.

Callidiopsis, long ago proposed to be separated from *Phoracantha*, has been recently described by M. J. Thomson, who has also adopted *Callirhoë*, though under another name; and thus it becomes necessary to examine what remains. *Phoracantha* as a genus was never in a very satisfactory state. Mr. Newman characterized it in a most general way (it was difficult, indeed, to do otherwise), but giving as a reason that "descriptionem fusio-rem haud requirat genus percognitum." It included several series of forms, each of which, taken as a group of species, could scarcely be distinguished by characters without admitting certain exceptions, or by using others which further observations might prove to be only of specific importance; and hence *Phoracantha* has stood, like many other genera, a collection of many discrepant species. With the materials I have before me, I have proposed the following genera, which I think will be found to include only obviously related species, and no others. They are taken in an ascending scale, *Phorocantha* standing nearly in the middle. The characters of *Phoracantha*, as here limited, are as follows:—

PHORACANTHA.

Caput pone oculos haud elongatum; *frons* brevis, apice lata. *Labrum* transversum. *Antennæ* elongatæ (♀ multo breviores), articulis subteretibus, 3^{io}–6^{tum} apice spinosis. *Prothorax* latus, longitudine latitudini fere æquali, lateribus spinosis. *Elytra* oblonga, apicibus bispinosis. *Femora* in medio vix incrassata; *tibiæ* anticæ rectæ. *Corpus* plerumque robustum.

The type is *Phoracantha semipunctata*, Fab. (*Stenochorus*).

EPITHORA.

Caput pone oculos elongatum; *frons* brevis, apice angustata. *Labrum* parvum. *Antennæ* corpore duplo longiores, articulis cylindricis, 3^{io}–7^{tum} apice spina valida instructis. *Prothorax* oblongus, lateribus inæqualis. *Elytra* elongata, apicibus bispinosis. *Femora* in medio incrassata; *tibiæ* anticæ curvæ. *Corpus* elongatum.

The type is *Epithora dorsalis*, MacLeay (*Stenochorus*). This genus is peculiarly distinguished by the greater length of the head, and the curved anterior tibiæ.

Mr. Newman has done little more than suggest the name of *Callirhoë* for the following, in the event of its being "raised to generic honours." Mr. Hope includes it in his genus *Coptocercus*.

CALLIRHOË.

Frons subbrevis, apice angustata. *Labrum* parvum. *Antennæ* articulis

3^{io}–6 vel 7^{mum} apice spinosis. *Prothorax elongatus*, lateribus tuberculatus (ex. *aberrans* et *polita*). *Elytra* modice elongata, apicibus univel bispinosis (ex. *pubescens*). *Femora* valde clavata, basi elongata. *Corpus* angustatum.

The type is *Callirhoë biguttata*, Don. (*Stenochorus*). The long, strongly clavate femora, and narrow body, will in general at once distinguish this genus. These characters hold good for all the species except *C. aberrans*, which has only moderately clavate femora.

ATESTA.

Frons brevis, apice angustata. *Labrum* minutum. *Antennæ* mediocres, articulo tertio apice valde spinoso, quarto obsolete spinoso, cæteris inermibus. *Prothorax* elongatus, lateribus tuberculatus. *Elytra* parallela, apice rotundata. *Femora* in medio incrassata. *Corpus* modice elongatum.

The type is *Atesta balteata*, Pasc. (*Phoracantha*). The only genus with the apex of the combined elytra rounded; *A. Angasii*, is so far exceptional that a very short mucro may be seen with the aid of a lens at the sutural angle.

ALLOTISIS.

Frons brevis, apice lata. *Labrum* breve, transversum. *Antennæ* setaceæ, articulis tertio et quarto apice subspinosis. *Prothorax* elongatus, lateribus tuberculatus. *Elytra* parallela, apicibus truncatis, haud spinosis. *Femora* clavata, basi elongata. *Corpus* gracile.

The type is *Allotisis scitula*, Pasc. (*Phoracantha*). The spines on the antennæ are reduced to a minimum in this genus, while the truncated apices of the elytra mark the first approach to spines, which we find throughout the remainder.

DIOSPIDES.

Frons subbreve apice subangustata. *Labrum* transversum. *Antennæ* articulis depressis, 3^{io}–8^{mum} apice valde spinosis. *Prothorax* longitudine haud latior, lateraliter spinosus. *Elytra* oblonga, apicibus bispinosis. *Femora* sublinearia, *tibiæ* et *tarsi* graciles. *Corpus* robustum.

The only species is *Diospides obscurus*, Don. (*Stenochorus*). It is principally distinguished from *Phoracantha* by its linear or nearly linear femora.

TRYPHOCHARIA.

Frons paulo producta, apice angustata. *Labrum* transversum. *Antennæ* corpore vix longiores (in fœm. breviores), articulis 3^{io}–8^{mum} apice bispinosis. *Prothorax* parvus, lateraliter spinosus. *Elytra* ampliata, apicibus bispinosis (ex. *Odewahnii*). *Femora* linearia. *Corpus* permamplum.

The type is *Phoracantha hamata*, Newm. The genus is remarkable for its small prothorax and its large elytra.

XYPETA.

Frons brevissima, apice dilatata. *Labrum* mediocre. *Antennæ* corpore longiores, 11-articulatæ, articulis plus minusve depressis, 3^{to}-6^{um} apice bispinosis, art. ultimo inciso, articulum duodecimum simulante. *Prothorax* subtransversus, lateraliter dentatus. *Elytra* oblonga, apicibus bispinosis. *Pedes* antici breves, postici longissimi; *femora* linearia, postica extremitatem corporis superantia. *Corpus* robustum.

The only species has been recently described by me under the name of *Phoracantha grallaria*, and is one of the most remarkable of the whole subfamily, owing to its very short anterior legs, and the unusual length and slenderness of the remainder.

DIDYMOCANTHA BREVICOLLIS.

D. fusca, sparse pilosa, aliter fere glabra; prothorace transverso; scutello fusco; elytris testaceis, nitidis, vage punctatis, plaga obliqua humerali et apice fuscis; antennis fœminarum corpore brevioribus.

Hab. Western Australia (Perth).

Dark brown, nearly free from pubescence, except on the antennæ, but with numerous scattered erect hairs, each arising from a comparatively large puncture; prothorax transverse, with nine tubercles, three on the disk, and three on each side; scutellum brown; elytra very distinctly punctured, the punctures small and rather dispersed, a semi-circular obliquely placed mark at the shoulder, and the apex, dark brown; body beneath and legs brown, the basal half of the tibiæ fulvous; antennæ of the female shorter than the body, the first two joints brown, the third to the sixth fulvous, with brown tips, the remainder dusky. Length 7 lines.

Distinguished from *D. obliqua* by the shortness of its prothorax and antennæ, and its nearly glabrous and shining surface. My specimen was kindly presented to me by Mr. Du Boulay.

STRONGYLURUS ORBATUS.

S. brunneo-testaceus, subnitidus, pilis albis adpressis dispersis; oculis infra valde approximatis; prothorace haud maculato, epipleuris metathoracis dense niveo pilosis.

Hab. Queensland.

Brownish testaceous, subnitid, with scattered, white, mostly adpressed hairs; head contracted below the eyes, but gradually broader towards the mandibles; eyes closely approximate beneath; prothorax rather finely punctured, uniformly pilose; scutellum subscutiform, rounded posteriorly, densely covered with white hairs; elytra strongly punctured at the base, gradually becoming less so posteriorly, each puncture giving rise to a single hair, the apex of each elytron a little rounded at the suture, where it terminates in a strongly marked spine, two or four irregular, brown, and probably uncertain, zigzag spots on

the disk; body beneath and legs thinly clothed with long pale-greyish hairs; the epipleuræ of the metathorax with a dense white pile; antennæ with the five basal joints covered with loose stiffish hairs, the remainder with a fine uniform pubescence. Length 12 lines.

Allied to *S. scutellatus*, Hope*, but without any spots on the prothorax, the apex of each elytron strongly spined, the eyes considerably more approximate beneath, the metathoracic epipleuræ covered with a dense white pile, and other characters.

OXYMAGIS.

Caput antice paulo productum. *Oculi* prominuli, anguste emarginati, supra distantes. *Antennæ* breviusculæ, basi remotæ; scapo modice elongato, obconico; articulis tertio et quarto brevioribus, cylindricis; cæteris paulo longioribus et subæqualibus. *Palpi* breves, articulo ultimo triangulari. *Prothorax* capite latior, apice angustus, antice utrinque rotundatus, basi bisinuatus, angulis posticis productis. *Elytra* prothorace multo latiora, oblonga, parallela. *Pedes* mediocres, antici breviores, postici longiores; *femora* in medio incrassata; *tarsi* subdilati, fere æquales. *Acetabula* antica integra. *Prosternum* latum, elevatum, postice transverse dilatatum. *Mesosternum* elevatum, antice dilatatum et perpendiculare.

Nearly related to *Strongylurus*, Hope, but the palpi short, with the terminal joint triangular, and the pro- and mesosterna produced, with broad opposing perpendicular faces. I have dedicated the species described below to Dr. Gray.

OXYMAGIS GRAYII.

O. fuscus, sparse griseo pubescens; prothorace lateribus dense albo tomentoso; elytris brunneis; antennis, tibiis tarsisque fulvo-ferrugineis. *Hab.* —?

Dark brown, with scattered greyish adpressed hairs, each issuing from a small puncture in the derm; head with a wide semicircular impression between the eyes; prothorax with a dense pure-white tomentose stripe on each side; elytra reddish brown, the apex of each rounded; body beneath thickly pubescent at the sides; antennæ, tibiæ, and tarsi yellowish ferruginous. Length 11 lines.

OPSIDOTA ALBIPILOSA.

O. fusca, supra sparse albo pilosa, infra dense pilosa; antennis brunneis, subtilissime pubescentibus; tarsis rufescentibus.

Hab. South Australia (Gawler).

* This was the type of my genus *Isalium*. At the time of proposing it I was under the impression that *Strongylurus*, Hope, was synonymous with *Didymocantha*, Newm.; the former author, however, gives *S. scutellatus* as the type, not distinguishing it from *Didymocantha*, but separating *Coptopterus*.

Dark brown, covered above with numerous, slightly dispersed, white hairs, one, or sometimes two or three, issuing from a puncture in the derm; body beneath with more closely set hairs nearly concealing the derm; elytra apiculate at the suture; antennæ reddish brown, covered, except the first two joints, with a very delicate pubescence; legs brown, with a greyish pile, the tips of the tibiæ and tarsi reddish. Length 12 lines.

A much finer species than *O. infecta*, more cylindrical, the prothorax more rounded at the sides and without spots, and the tarsi more dilated, if this be not, as in some other cases, a sexual character. I owe my specimen to the kindness of Mr. Odewahn.

PAPHORA.

Caput porrectum, ovatum; *tuberibus* antenniferis brevibus, remotis.

Oculi reniformes. *Antennæ* breves, scapo quam articuli tertii et quarti longiore, cæteris paulo longioribus. *Mandibulæ*, *palpi* &c. breviuscula. *Prothorax* ovatus, basi apiceque truncatus, capite paulo latior. *Elytra* breviuscula, lateribus parallela, apicibus rotundatis. *Pedes* mediocres; *femora* vix incrassata; *tibiæ* quam tarsi longiores. *Pro-* et *mesosterna* declivia, hoc haud elongatum. *Abdominis* segmenta sensim breviora.

The type of this genus is my *Ceresium*? *modestum* (Journ. Ent. ii. p. 237). The genus, however, is nearer *Bebius* (*op. cit.* p. 369); but it has no muzzle, and is altogether a much shorter form, with longer legs. It agrees with it in having the scape longer than either the third or fourth joints—a peculiarity which at present distinguishes these genera from all others of the subfamily belonging to the Australian fauna.

PORITHEA.

(♂) *Caput* antice breve, transversum. *Oculi* magni, reniformes. *Antennæ* corpore multo longiores, scapo clavato, articulo tertio longiore, quarto brevior, quinto et sequentibus longioribus. *Palpi* securiformes. *Prothorax* basi constrictus. *Elytra* parallela, apice rotundata. *Pedes* longiores; *femora* valida, valde clavata, postica elytrorum extremitatem superantia; *tibiæ* subelongatæ; *tarsi* antici dilatati. *Prosternum* simplex. *Mesosternum* declive. (♀) *Antennæ* et *pedes* breviores; *femora* minora; *tarsi* antici haud dilatati.

There are three or four unpublished Malayan genera that will come between this genus and *Ceresium*. The chief characters, however, that will differentiate it from cognate forms lie in the contracted base of the prothorax, the stout clavate (not fusiform) femora, especially of the male (in which sex the posterior pair extend beyond the end of the body), and the short transverse face. The type (*Callidium intortum*, Newm.) is in Major Parry's col-

lection; but the precise habitat of that and his other specimens, like the one in my own, is unknown.

ARIDÆUS HEROS.

A. rufo-flavus, nigro fasciatus; prothorace oblongo-ovato, antice angustato; elytris apice truncatis, angulo exteriore producto; antennis muticis.

Hab. Port Albany (north coast).

Nearly glabrous, rufous yellow, banded, or otherwise varied with black; head with a deep semicircular impression above the clypeus, labrum sinuato-emarginate; prothorax oblong ovate, narrowed anteriorly, closely punctured, the intervals sharply irregular, behind on each side a broad slightly elevated protuberance, the sides black, clothed with greyish hairs; scutellum triangular, with a fulvous-grey pilosity; elytra covered with closely-set deeply-impressed punctures, posteriorly several black tubercular points, from the scutellum on each side a black curved stripe extends downwards and outwards as far as the middle, a curved band of rufous yellow follows, the remainder black, apices truncate, the outer angle produced; body beneath and legs black, a fulvous patch on the abdomen, and the anterior femora, except at the base, fulvous; fore and intermediate tarsi clothed with yellowish hairs; antennæ black. Length 10 lines.

Besides the difference of colour, which, however, is probably variable, this species differs from *A. thoracicus* in the longer prothorax, so narrowed anteriorly as to give it an ovate form, in the very decided truncation of the elytra, and the antennæ without apical spines in the male.

HOMEMOTA DUBOULAYI.

H. rufo-brunnea, parte apicali nigra, nitida; femoribus posticis pone corpus exeuntibus.

Hab. Western Australia (*Mr. Du Boulay*).

Reddish brown, with long slender dispersed hairs; head finely punctured, a broad groove between the eyes terminating above the mouth in a semilunar impression; prothorax with numerous shallow, almost obsolete punctures, much longer than broad, its base slightly elongated; scutellum parallel at the base, triangular towards the apex; elytra divided in the middle by an oblique ivory line, reddish brown, and thickly punctured anteriorly to this line, behind the line nearly impunctate, glossy, gradually acquiring a whitish pubescence towards the apex; body beneath black; the breast reddish brown; legs reddish brown; the femora robust, the posterior extending beyond the elytra; antennæ longer than the body, reddish brown. Length 4 lines.

This species is closely allied to *H. basalis*, but differs in colour, in the less punctured prothorax, which is much more elongated

at the basal constricted portion, differently shaped scutellum, longer legs, and considerably stouter femora.

ECTOSTICTA.

Antennæ corpore breviores, scapo articulo tertio fere æquali, sequentibus brevioribus et subæqualibus. *Oculi* subtenuiter granulati. *Prothorax* basi haud attenuatus. *Acetabula* antica fere integra. *Cæteris* ut in *Ipomoria*.

The type of this genus is the *Callidium cleroides*, White. It is a stouter form than *Homæmota*, with which it agrees in its nearly entire anterior acetabula; but differs in the shorter antennæ, the altered proportions of their basal joints, and the rounded prothorax not attenuated at the base. The following is a new species.

ECTOSTICTA RUIDA.

E. fusca, nitida; capite prothoraceque rufis, hoc grosse punctato; scapo nitido, disperse punctato; elytris omnino confertim punctatis, flavo bifasciatis.

Hab. Champion-Bay (West Australia).

Slightly pilose, dark brown, shining; head reddish, closely punctured; antennæ reddish, apices of most of the joints dark brown, the scape shining, sparingly punctured; prothorax reddish, with much larger punctures than in *E. cleroides*; scutellum subquadrate; elytra entirely punctured, but the punctures larger and less crowded posteriorly, the base reddish, between the base and middle a transverse yellowish line, interrupted at the suture, directly behind the middle a somewhat V-shaped line; body beneath shining, the last four abdominal segments and legs dark brown, the bases of the femora and sterna reddish. Length 4 lines.

IPOMORIA.

Caput insertum, triangulare, antice paulo productum, tuberibus antenniferis obsoletis. *Oculi* mediocres, reniformes, tenuiter granulati. *Antennæ* corpore breviores, basi distantes, scapo obconico; articulo tertio brevior, apice mutico; cæteris longioribus, apicibus incrassatis. *Mandibulæ* parvæ. *Prothorax* ad latera rotundatus, basi attenuatus. *Elytra* brevina, parallela. *Coxæ* anticæ globosæ, subcontiguæ. *Acetabula* antica subanguste angulata. *Femora* abrupte clavata; *tarsi* breviusculi. *Pro-* et *mesosterna* declivia. *Corpus* depressum.

Mr. Newman's genus *Monoplia* appears to be very nearly allied to this, and to be distinguished principally by the third joint of the antennæ being spined, as in *Apilocera*, *Cyrtophorus*, &c. *Ipomoria* is also allied to *Homæmota* and *Ectosticta*, but is differentiated from both by the shortness of the third joint of the antennæ, which is shorter than the scape.

IPOMORIA TILLIDES.

I. fusca, subnitida; prothorace longitudinaliter plicato; elytris fasciis duabus interruptis flavescentibus.

Hab. South Australia.

Dark brown, slightly nitid; head closely punctured; prothorax broader than the head, marked longitudinally with a number of short raised lines, the middle with two large shallow depressions; scutellum subquadrate, slightly bilobed at the apex; elytra not broader than the prothorax, rugosely punctured, but the punctures fewer posteriorly; each elytron with two yellowish bands, the first before the middle, widely interrupted at the suture, the second behind the middle, nearly approaching the suture; body beneath and femora glossy brown, anterior femora rather compressed; antennæ a little more than half the length of the body, pitchy, with a few long scattered hairs. Length 3 lines.

ADRIUM.

Oculi grosse granulati. *Antennæ* corpore breviores vel elytrorum medium vix superantes, articulo tertio quam scapus brevior, illo quarto æquali, sequentibus longioribus. *Prothorax* postice constrictus, disco impresso. *Acetabula* antica fere integra. Cæteris ut in *Ipomoria*.

Callidium catoxanthum, White, is the type of this genus, which, like *Ipomoria* and *Ectostieta*, has more the habit of a *Callidium* than of a *Clytus*; nevertheless the coarsely granulated eyes and nearly entire anterior acetabula are at variance with the two most important characters of the *Callidiinæ*.

CEBARINA.

Caput antice breve, tuberibus antenniferis obsoletis. *Oculi* magni, anguste emarginati, grosse granulati. *Antennæ* corpori vix æquales, vel breviores, graciles, basi modice distantes, scapo brevi, obconico, articulo quarto quam tertius brevior, cæteris longioribus et æqualibus vel fere æqualibus. *Palpi*, præsertim maxillares, elongati, articulo ultimo triangulari. *Prothorax* oblongus, lateribus subparallelis vel leviter rotundatis. *Elytra* elongata, parallela. *Pedes* modice elongati; femora fusiformia; tibiæ sublineares; tarsi graciles, posticæ fere lineares. *Coxæ* anticæ globosæ. *Acetabula* antica integra. *Prosternum* angustum, postice acutum. *Mesosternum* latum, declive. *Corpus* depressum.

Differs from *Phacodes*, Newm., in the elongate palpi terminating in a broadly triangular joint, and in the slender and nearly linear tarsi.

CEBARINA TRISTIS.

Ce. fusca, nitida, sparse albo hirta; prothorace lateribus subparallelis.

Hab. South Australia (*Mr. Odewahn*).

Dark brown, shining, with scattered stiff whitish hairs; head and prothorax equal in breadth, covered with close confluent punctures; the latter oblong, narrower posteriorly, with its sides somewhat parallel; scutellum whitish from numerous close-set and decumbent hairs; elytra a little broader than the prothorax, thickly but not confluent punctured, the sides perfectly parallel, the apex rounded; body beneath and legs chestnut-brown, shining, with sparse decumbent hairs; antennæ brownish testaceous, rather shorter than the body. Length 5 lines.

CEBARINA CERESIOIDES.

Æ. fusca, nitida, sparse albo hirta; prothorace lateribus rotundatis.

Hab. South Australia (*Mr. Odewahn*).

Dark brown, shining, with scattered stiff whitish hairs; head narrower than the prothorax; the latter rounded at the sides, and scarcely longer than broad, both coarsely and confluent punctured; scutellum triangular, hairy, white; elytra closely and more coarsely punctured than in *Æ. tristis*, and slightly incurved behind the shoulders; body beneath and legs as in *Æ. tristis*, but the postpectus reddish testaceous; antennæ pale ferruginous, much shorter than the body. Length 7 lines.

LAMIIDÆ.

ACANTHODERINÆ.

HEBESECIS.

Hebesecis, *Pascoe, Journ. of Entom.* ii. p. 353.

Hebecerus, *J. Thomson, Essai, etc.* p. 342 (non *Kolenati*).

HEBESECIS MARGINICOLLIS. (*Acanthocinus marginicollis, Boisduval, Voy. de l'Astrol.* ii. p. 490, pl. 9. f. 12.)

Hab. South Australia; Victoria; New South Wales; Queensland; Tasmania.

H. LINEOLA. (*Acanthocinus lineola, Newman, Zool.* 1855, *App.* cxxx.

Qu. var. *Hebecerus marginicollis, Bois.?*)

Hab. Victoria; Kangaroo Island; Tasmania.

H. AUSTRALIS. (*Acanthocinus Australis, Boisduval, Voy. de l'Astrol.* ii. p. 489. *Hebecerus inglorius, Newman, Entom.* p. 361.)

Hab. Victoria; New South Wales; South Australia.

H. CROCOGASTER, *Boisduval, Voy. de Astrol.* ii. p. 492.

Hab. South Australia; Victoria; New South Wales; Western Australia.

H. CONFERTA, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 528.

Hab. Queensland.

H. NIPHONOIDES, *Pascoe, ib.* p. 527.

Hab. Port Curtis, Western Australia.

H. SPARSA, *Pascoe, antè,* p. 81.

Hab. Western Australia.

? *H. FUSCICORNIS*. (*Acanthoderes fuscicornis*, *Germer, Linn. Ent.* iii. p. 227.)

Hab. South Australia.

H. VARICORNIS. (*Crossotus varicornis*, *Germer, Linn. Ent.* iii. p. 229.
? *H. marginicollis*, *Bois.*)

Hab. South Australia; New South Wales.

H. GERMARI, *Pascoe, Journ. of Entom.* ii. p. 352.

Hab. South Australia.

H. SORDIDA, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 527. (*Velora Australis*, *Thomson, Syst. Ceramb.* p. 56.)

Hab. Clarence River.

H. ANTENNATA, *Pascoe, Journ. of Entom.* ii. p. 353.

Hab. Port Denison.

PROBATODES.

Probatodes, *J. Thomson, Syst. Ceramb.* p. 56.

PROBATODES PLUMULA. (*Acanthocinus?* *plumula*, *Newm. Zool.* 1855, *App.* cxxx.)

Hab. Tasmania; Victoria.

AMEIPSIS.

Ameipsis, *Pascoe, Journ. of Entom.* ii. p. 354.

AMEIPSIS MARGINICOLLIS, *Pascoe, ib.* p. 354.

Hab. Queensland.

PROSOPLUS.

Prosoplus, *Blanchard, Voy. au Pôle Sud*, iv. p. 290.

PROSOPLUS HOLLANDICUS. (*Acanthocinus Hollandicus*, *Boisd. Voy. de l'Astrol.* ii. p. 491.)

Hab. — ?

EXOCENTRINÆ.

PENTACOSMIA.

Pentacosmia, *Newman, Entom.* p. 361.

PENTACOSMIA SCOPARIA, *Newm. Ent.* p. 361.

Hab. Victoria; Queensland.

NEISSA.

Neissa, *Pascoe, antè*, p. 82.

NEISSA INCONSPICUA, *Pascoe, antè*, p. 82, tab. 3. fig. 4.

Hab. Gawler.

N. NIGRINA, *Pascoe, antè*, p. 82.

Hab. Gawler.

ILLÆNA.

Illæna, *Erichson, Wiegmann's Arch.* 1842, p. 225.

ILLÆNA EXILIS, *Erichson, ib.* p. 225.

Hab. Tasmania.

MESOSINÆ.

BUCYNTHIA.

Bucynthia, *Pascoe, antè*, p. 83.

BUCYNTHIA SPILOPTERA. (*Hygocera spilopectera*, *Pascoe, Trans. Ent. Soc. ser. 3. i.* p. 542.)

Hab. Hunter's River.

NIPHONINÆ.

ÆGOMOMUS.

Ægomomus, *Pascoe, Long. Malay.* p. 59.

Micracantha, *Montrouzier* (nom. præoc.?), *Ann. de la Soc. Ent. de France*, ser. 4. i. p. 271.

ÆGOMOMUS WOODLARKIANUS. (*Penthea woodlarkiana*, *Montrouzier, Faune de Woodlark*, p. 65. *Niphona bakewellii*, *Pascoe, Trans. Ent. Soc. ser. 2. v.* p. 38. *Praonetha porosa*, *Faldermann.*)

Hab. Queensland.

Æ. TOROSUS. (*Niphona torosa*, *Pascoe, Journ. of Entom.* ii. p. 223.)

Hab. South Australia.

Æ. MISELLUS, *Pascoe, Trans. Ent. Soc. ser. 3. i.* p. 529.

Hab. Port Curtis.

Æ. OBLITUS, *Pascoe, ib.* p. 530.

Hab. New South Wales.

Æ. IRATUS, *Pascoe, Ann. & Mag. Nat. Hist.* ser. 3. ix. p. 464.

Hab. Lizard Island.

Æ. INSULARIS, *Pascoe, Trans. Ent. Soc. ser. 2. v.* p. 39 (1857).

Coptops abdominalis, *White, Ann. & Mag. Nat. Hist.* 3 ser. ii. p. 273 (1858).

Hab. Port Essington.

CORRHENES.

Corrhenes, *Pascoe, Journ. of Entom.* ii. p. 355.

Saperda, *Germar, Linn. Ent.* iii. p. 230.

CORRHENES PAULA. (*Saperda paula*, *Germar, ib.* p. 230.)

Hab. New South Wales; South Australia; Victoria.

C. FUNESTA. (*Saperda funesta*, *Pascoe, Trans. Ent. Soc. ser. 2. v.* p. 53.)

Hab. South Australia.

C. STIGMATICA. (*Saperda stigmatica*, *Pascoe, ib.* ser. 3. i. p. 544.)

Hab. Port Curtis.

C. MYSTICA. (*Saperda mystica*, *Pascoe, ib.* p. 545.)

Hab. New South Wales?

C. GUTTATA, *Pascoe, Journ. of Entom.* ii. p. 355.

Hab. New South Wales.

SYSSPILOTUS.

Sysspilotus, *Pascoe, ib.* p. 359.

SYSSPILOTUS MACLEAYI, *Pascoe, ib.* p. 360.

Hab. Rockhampton.

SYMPHYLETES.

Symphyletes, *Newman, Entom.* p. 362.

SYMPHYLETES NODOSUS, *Newman, ib.* p. 362. (*Lamia pulverulens*,
Boisduval, Voy. de l'Astrol. ii. p. 501. *L. subfasciata*, *Hope.*)

Hab. Victoria; New South Wales; Queensland.

S. FUMATUS, *Pascoe, Journ. of Entom.* ii. p. 224.

Hab. South Australia.

S. ARCTOS, *Pascoe, ib.* p. 356.

Hab. Western Australia; South Australia.

S. PEDICORNIS. (*Lamia pedicornis*, *Fabricius, Syst. Ent.* p. 170. *Cerambyx pedicornis*, *Olivier, Ent.* no. lxxvii. pl. 16. f. 119, p. 94.)

Hab. New South Wales; Port Curtis.

S. INGESTUS, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 537.

Hab. New South Wales.

S. VETUSTUS, *Pascoe, Ann. & Mag. Nat. Hist.* ser. 3. ix. p. 264.

Hab. Lizard Island.

S. MORATUS, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 536.

Hab. Port Curtis.

S. DEVOTUS, *Pascoe, antè*, p. 83.

Hab. Western Australia.

S. SOLUTUS, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 535.

Hab. Port Curtis.

S. MUNITUS, *Pascoe, ib.* p. 536.

Hab. Clarence River.

S. NEGLECTUS, *Pascoe, ib.* p. 534.

Hab. New South Wales.

S. SODALIS, *Pascoe, ib.* ser. 2. iv. p. 41.

Hab. Queensland.

S. FARINOSUS, *Pascoe, ib.* ser. 3. i. p. 533.

Hab. Port Curtis.

S. ANGASII, *Pascoe, Journ. of Entom.* ii. p. 225, pl. 11. f. 1.

Hab. South Australia; Western Australia.

S. PUBIVENTRIS, *Pascoe, ib.* i. p. 339.

Hab. South Australia.

S. DUBOULAYI, *Pascoe*, *antè*, p. 83.

Hab. Western Australia.

S. MACULICORNIS, *Pascoe*, *Trans. Ent. Soc.* ser. 2. iv. p. 250.

Hab. Western Australia.

S. SUBTUBERCULATUS, *White*, *Ann. & Mag. Nat. Hist.* ser. 3. ii. p. 269.

Hab. —?

S. FULVESCENS, *Pascoe*, *Trans. Ent. Soc.* ser. 3. i. p. 531.

Hab. Port Curtis.

S. SUBMINIATUS, *Pascoe*, *antè*, p. 84.

Hab. Western Australia.

S. CINNAMOMEUS, *Pascoe*, *Trans. Ent. Soc.* ser. 2. v. p. 59.

Hab. Queensland.

S. LATERALIS, *Pascoe*, *ib.* ser. 2. iv. p. 250.

Hab. Western Australia; South Australia.

S. COLLARIS. (*Saperda collaris*, *Donovan*, *Epit. Ins. N. Holl.* &c. pl.

Hab. —?

S. DECIPIENS, *Pascoe*, *Trans. Ent. Soc.* ser. 3. i. p. 532.

Hab. South Australia.

S. NIGRO-VIRENS, *Donovan*, *Ins. of New Holland*, pl.

Hab. New South Wales; Queensland.

S. DERASUS, *Pascoe*, *Trans. Ent. Soc.* ser. 3. i. p. 532.

Hab. New South Wales.

S. EGENUS, *Pascoe*, *Journ. of Entom.* ii. p. 225.

Hab. North Australia.

S. SATELLES, *Pascoe*, *ib.* p. 357.

Hab. Western Australia.

S. SIMIUS, *Pascoe*, *antè*, p. 85.

Hab. Champion Bay (Western Australia).

S. BATHURSTII, *Pascoe*, *antè*, p. 85.

Hab. South Australia (Gawler).

S. VARIOLOSUS, *Pascoe*, *Journ. of Entom.* i. p. 340.

Hab. New South Wales; Queensland; South Australia.

S. ILIACUS, *Pascoe*, *antè* p. 84.

Hab. Champion Bay (Western Australia).

S. VICARIUS, *Pascoe*, *Journ. of Entom.* ii. p. 356.

Hab. New South Wales? Queensland.

S. HUMERALIS, *White*, *Ann. & Mag. Nat. Hist.* ser. 3. ii. p. 269.

Hab. North Australia (Port Essington).

S. GALLUS, *Pascoe*, *Journ. of Entom.* ii. p. 226.

Hab. North Australia (*Stewart's Expedition*).

S. ALBO-CINCTUS. (*Saperda albo-cincta*, Guérin, *Voy. de la Coq.* t. ii. p. 137, pl. 7. f. 7. *Rhytiphora* Donovan, *Newman, Zool.* 1851, *App.* cxxix. ?*S. collaris*, *Donovan*.)

Hab. New South Wales ; Queensland.

S. VESTIGIALIS, *Pascoe, Journ. of Entom.* ii. p. 226.

Hab. South Australia.

S. SOLANDRI. (*Lamia Solandri*, *Fabricius, Syst. Ent.* p. 177. *Cerambyx Solandri*, *Olivier, Entom.* no. lxxvii. pl. 16. f. 118, p. 100.)

Hab. New South Wales.

IPHIASTUS.

Iphiastus, *Pascoe, Journ. of Entom.* ii. p. 357.

IPHIASTUS HEROS. (*Symphyletes heros*, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 531 ; *Journ. of Entom.* ii. pl. 16. f. 4.)

Hab. (Interior?) Australia (*Stewart's Expedition*).

PLATYMOPSIS.

Platymopsis, *J. Thomson, Arch. Entom.* i. p. 187.

PLATYMOPSIS OBLIQUA. (*Lamia obliqua*, *Donovan, Ins. New Holl.* pl.)

Hab. Queensland ; New South Wales ; South Australia.

P. TUBERCULATA. (*Rhytiphora tuberculata*, *Hope, Ann. & Mag. Nat. Hist.* 1842, ix. p. 429.)

Hab. Port Essington.

P. ARMATULA. (*Symphyletes* (*Platymopsis*) *armatulus*, *White, Proc. Zool. Soc.* 1859, p. 122, pl. 59. f. 8.)

Hab. (South?) Australia.

RHYTIPHORA.

Rhytiphora, *Serville, Ann. Soc. Ent. de France*, iv. p. 37.

RHYTIPHORA RUGICOLLIS. (*Lamia porphyrea*, *Donovan. L. rugicollis*, *Dalman, Schön. Syn. Ins.* iii. *App.* 169.)

Hab. New South Wales ; Queensland.

R. AMICULA, *White, Proc. Zool. Soc.* 1859, p. 122, pl. 59. f. 7.)

Hab. Victoria River.

R. POLYMITA, *Pascoe, Trans. Ent. Soc.* ser. 2. v. p. 60.

Hab. Queensland.

R. WATERHOUSEI, *Pascoe, Journ. of Entom.* ii. p. 228.

Hab. South Australia.

R. PIPERITIA, *Hope, Ann. & Mag. Nat. Hist.* 1842, ix. p. 429.

Hab. Port Essington.

R. DETRITA, *Hope, Ann. & Mag. Nat. Hist.* 1842, ix. p. 429.

Hab. Port Essington.

R. SOSPITALIS, *Pascoe, Journ. of Entom.* ii. p. 358.

Hab. Western Australia.

R. CAPRINA, *Newman, Entom.* p. 362.

Hab. South Australia ; Victoria.

R. MISTA, *Newman, ib.* p. 362.

Hab. Victoria.

R. SAGA, *Pascoe, Journ. of Entom.* ii. p. 358.

Hab. Western Australia.

R. SEMIVESTITA, *Pascoe, antè,* p. 86.

Hab. Western Australia (Perth).

R. RUBETA, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 538.

Hab. New South Wales.

R. CRETATA, *Pascoe, ib.* ser. 2. v. p. 60.

Hab. Queensland.

PENTHEA.

Penthea, *Laporte, Hist. Nat. des An. Art.* ii. p. 476.

PENTHEA VERMICULARIA. (*Lamia vermicularia*, *Donovan, Ins. New Holl.*)

Hab. New South Wales ; Queensland.

P. SOLIDA, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 538.

Hab. Clarence River.

P. COSTATA, *Pascoe, ib.* p. 539.

Hab. New South Wales ; Western Australia.

P. SAUNDERSII, *Pascoe, ib.* ser. 2. iv. p. 103.

Hab. Western Australia.

P. PULLINA, *Pascoe, ib.* ser. 3. i. p. 539.

Hab. Western Australia.

P. SANNIO. (*Lamia sannio*, *Newman, Entom. Mag.* v. p. 498.)

Hab. —?

P. PARDALIS. (*Lamia pardalis*, *Newman, Entom.* p. 414.)

Hab. New South Wales ; Queensland.

P. MILIARIS, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 540.

Hab. Port Curtis.

P. INTRICATA, *Pascoe, Journ. of Entom.* ii. p. 227.

Hab. South Australia.

P. SCENICA, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 540.

Hab. Port Curtis.

P. CRASSICOLLIS, *Pascoe, Journ. of Ent.* ii. p. 227.

Hab. Interior of Australia (*Stewart's Expedition*).

P. PICTA, *Pascoe, ib.* p. 227, pl. 11. f. 5.

Hab. South Australia.

P. SECTATOR, *Pascoe, ib.* p. 358.

Hab. South Australia.

DEPSAGES.

Depsages, *Pascoe, ib.* p. 359.

DEPSAGES GRANULOSA. (*Lamia granulosa, Guérin, Voy. de la Coq.*
ii. p. 133, pl. 7. f. 8.)

Hab. New South Wales.

MONOCHAMUS.

Monochamus, *Serville, Ann. Soc. Entom. de France*, iv. p. 91.

MONOCHAMUS FISTULATOR. (*Lamia fistulator, Germar, Ins. Spec.*
nov. p. 478.)

Hab. New South Wales; Queensland.

M. MIXTUS, *Hope, Ann. & Mag. Nat. Hist.* 1842, ix. p. 428.

Hab. Port Essington; Queensland.

M. ARGENTATUS, *Hope, MS.?*

Hab. New South Wales; Victoria.

M. OVINUS, *Pascoe, Journ. of Entom.* ii. p. 228.

Hab. South Australia.

METON.

Meton, *Pascoe, ib.* i. p. 342.

METON DIGGLESII, *Pascoe, Trans. Ent. Soc.* ser. 2. v. p. 59.

Hab. Queensland.

M. TROPICUS, *Pascoe, Ann. & Mag. Nat. Hist.* ser. 3. ix. p. 465.

Hab. Lizard Island.

BATOCERA.

Batocera, *Laporte de Castelnau, Hist. Nat. des Ins.* ii. p. 470.

BATOCERA RUBUS. (*Cerambyx rubus, Linn. Syst. Nat.* ed. 12. ii.
p. 625. *Batocera rubus, Blanchard, Hist. Nat. des Ins.* ii. p. 158,
pl. 12. f. 4.)

B. BOISDUVALII. (*Lamia Boisduvalii, Hope, Charlesworth's Mag. Nat.*
Hist. iii. p. 231.)

Hab. Clarence River?

HYPSELOMINÆ.

CALLIPYRGA.

Callipyrga, *Newman, Entom.* p. 414.

CALLIPYRGA TURRITA, *Newman, ib.* p. 414; *White, Stokes's Discov.*
in Aust. pl. 2. f. 5. (*Zygocera pallidicornis, J. Thomson, Arch. Ent.*
i. p. 190.)

Hab. New South Wales; Queensland.

ZYGOCERA.

Zygocera, *Erichson*, *Wiegmann's Arch.* 1842, p. 224.

ZYGOCERA PRUINOSA. (*Acanthocinus pruinus* (*Macleay*), *Boisduval*,
Voy. de l'Astrol. Ent. p. 489; *Westwood*, *Trans. Ent. Soc.* ser. 3. i.
p. 626, pl. 25. f. 6.)

Hab. New South Wales; Queensland.

Z. PENTHEOIDES, *Pascoe*, *Trans. Ent. Soc.* ser. 2. v. p. 32.

Hab. Western Australia.

Z. CENOSA, *Erichson*, *Wiegmann's Arch.* 1842, p. 223.

Hab. Tasmania.

Z. METALLICA, *Westwood*, *Trans. Ent. Soc.* ser. 3. i. p. 627, pl. 25.
f. 7.

Hab. South Australia; Western Australia.

DEMÓNASSA.

Demonassa, *J. Thomson*, *Syst. Ceramb.* p. 327.

DEMÓNASSA MACLEAYI. (*Zygocera Macleayi*, *Pascoe*, *Trans. Ent.*
Soc. ser. 2. v. p. 32. *Demonassa funeraria*, *Thomson*, *l. c.* p. 328.)

Hab. New South Wales.

DISTERNA.

Disterna, *J. Thomson*, *l. c.* p. 88.

DISTERNA LUGUBRIS. (*Zygocera lugubris*, *Pascoe*, *l. c.* ser. 3. i. p. 541.)

Hab. New South Wales.

D. LUCTUOSA. (*Zygocera luctuosa*, *Pascoe*, *Ann. & Mag. Nat. Hist.*
ser. 3. ix. p. 465.)

Hab. Lizard Island.

D. PLUMIFERA. (*Zygocera plumifera*, *Pascoe*, *Trans. Ent. Soc.* ser. 2.
v. p. 33.)

Hab. New South Wales.

D. CUNEATA. (*Zygocera cuneata*, *Pascoe*, *ib.* ser. 2. v. p. 33.)

Hab. New South Wales.

D. PUMILA. (*Zygocera pumila*, *Pascoe*, *ib.* ser. 3. i. p. 542.)

Hab. New South Wales.

D. BIFASCIATA. (*Zygocera bifasciata*, *Pascoe*, *ib.* ser. 2. v. p. 32.)

Hab. New South Wales.

ORICOPIS.

Oricopis, *Pascoe*, *ib.* ser. 3. i. p. 543.

ORICOPIS UMBROSUS, *Pascoe*, *ib.* ser. 3. i. p. 543, pl. 23. f. 2.

Hab. Port Curtis.

THYADA.

Thyada, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 544.

THYADA BARBICORNIS. (*Zygocera barbicornis, Pascoe, ib.* ser. 2. v. p. 34; ser. 3. i. p. 544, pl. 22. f. 4.)

Hab. South Australia; New South Wales; Queensland.

DYSTHÆTA.

Dysthæta, *Pascoe, ib.* ser. 2. v. p. 31.

DYSTHÆTA ANOMALA, *Pascoe, ib.* p. 31, pl. 2. f. 6.

Hab. New South Wales; Queensland.

DORCADIONINÆ.

MICROTRAGUS.

Microtragus, (*White, Pascoe, Journ. of Entom.* ii. p. 360.

MICROTRAGUS ARACHNE, *Pascoe, ib.* ii. p. 361.

Hab. Western Australia.

M. STICTICUS, *Pascoe, antè*, p. 86.

Hab. —?

M. SENEX, *White, Stokes's Discoveries in Australia*, i. p. 511, pl. 2. f. 7.

Hab. —?

M. EREMITA, *Pascoe, Journ. of Entom.* ii. p. 342.

Hab. South Australia (The Murray).

M. MORMON, *Pascoe, ib.* ii. p. 161.

Hab. South Australia (The Murray).

M. WATERHOUSEI, *Pascoe, ib.* p. 229.

Hab. Kangaroo Island.

M. AMYCTEROIDES, *Pascoe, Trans. Ent. Soc.* ser. 2. v. p. 61.

Hab. Queensland.

ATHEMISTUS.

Athemistus, *Pascoe, ib.* ser. 2. v. p. 49.

ATHEMISTUS RUGOSULUS. (*Lamia rugosula, Guérin, Voy. de la Coq.* ii. p. 134, pl. 7. f. 9.)

Hab. New South Wales.

A. PUBESCENS, *Pascoe, Journ. of Entom.* i. p. 352.

Hab. Victoria.

A. ARMITAGEI, *Pascoe, antè*, p. 87.

Hab. New South Wales.

A. FUNEREUS, *Pascoe, antè*, p. 87.

Hab. New South Wales.

CERÆGIDION.

Cerægidion, Boisduval, Voy. de l'Astrol. (1835) p. 492; *Mag. de Zool.* 1835.

CERÆGIDION HORRENS, *Boisd. Voy. de l'Astr.* p. 493; *Mag. de Zool.* 1835, pl. 127.

Hab. Australia (north coast).

MESOLITA.

Mesolita, Pascoe, Journ. of Entom. i. p. 362.

MESOLITA TRANSVERSA, *Pascoe, ib.* p. 363, pl. 17. f. 7.

Hab. Queensland.

M. LINEOLATA, *Pascoe, ib.*

Hab. Queensland.

APOMECCYNINÆ.

APOMECCYNA.

Apomeccyna, Serville, Ann. Soc. Ent. de France, iv. p. 77.

APOMECCYNA HISTRIO. (? *Lamia histrio, Fabricius, Ent. Syst.* ii. p. 288.)

Hab. Australia (north).

A. NIGRITA, *Pascoe, Trans. Ent. Soc.* ser. 2. v. p. 49.

Hab. Australia (North).

HATHLIODES.

Hathliodes, Pascoe, antè, p. 88.

Mycerinus, J. Thomson (in pt.).

Hathlia, Dejean (in pt.).

HATHLIODES GRAMMICUS. (*Mycerinus grammicus, Pascoe, Trans. Ent. Soc.* ser. 2. p. 49.)

Hab. Australia (interior towards the north).

H. MORATUS, *Pascoe, antè*, p. 89.

Hab. Australia (North).

H. MURINUS. (*Hathlia murina, Pascoe, Trans. Ent. Soc.* ser. 2. v. p. 50.)

Hab. Australia (interior towards the north).

H. ARIDUS. (*Mycerinus aridus, Pascoe, Ann. & Mag. Nat. Hist.* ser. 3. ix. p. 466. *Mycerinopsis arida, Thomson, Syst. Ceramb.* p. 50.)

Hab. Lizard Island.

H. UNIFORMIS. (*Mycerinus uniformis, Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 546.)

Hab. Port Curtis.

H. QUADRILINEATUS. (*Hathlia quadrilineata, Hope, Ann. & Mag. Nat. Hist.* 1842, ix. p. 429.)

Hab. Port Essington; Port Curtis; South Australia (Gawler).

H. LACTEOLUS. (*Hathlia lacteola*, *Hope, ib.* p. 429.)

Hab. Port Essington.

H. MELANOCEPHALUS. (*Hathlia melanocephala*, *Hope, ib.* p. 430. H. *gracilis*, *Voy. au Pôle Sud*, iv. p. 301, pl. 17. f. 18.)

Hab. Port Essington; Raffles Bay.

H. LINEELLUS. (*Hathlia lineella*, *Hope, ib.* p. 430.)

Hab. Port Essington.

LYCHROSIS.

Lychrosis, *Pascoe, antè*, p. 89.

LYCHROSIS LUCTUOSUS. (*Mycerinus luctuosus*, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 546, pl. 22. f. 5.)

Hab. Port Curtis.

PHÆAPATE.

Phæapate, *Pascoe, Journ. of Entom.* ii. p. 363.

PHÆAPATE ALBULA, *Pascoe, ib.* p. 363.

Hab. Queensland.

PRAONETHA.

Praonetha, *Blanchard* (scrip. *Prioneta*), *Voy. au Pôle Sud*, iv. p. 272

Pterolophia, *Newman, Entom.* p. 370.

Notolophia, *Brit. Mus.*

PRAONETHA DISPERSA. (*Notolophia dispersa* *Pascoe, Trans. Ent. Soc.* ser. 2. v. p. 47.)

Hab. Australia (north coast).

P. PLEURICAUSTA, *Pascoe, antè*, p. 89.

Hab. Port Albany.

SYBRA.

Sybra, *Pascoe, Trans. Ent. Soc.* ser. 3. iv. p. 198.

SYBRA INCIVILIS. (*Ropica incivilis*, *Pascoe, ib.* i. p. 546.)

Hab. Port Curtis.

S. ACUTA. (*Ropica geminata*, *Pascoe, ib.* p. 547, non *Klug.*)

Hab. New South Wales.

S. CENTURIO, *Pascoe, antè*, p. 90.

Hab. Sydney.

ROPICA.

Ropica, *Pascoe, Trans. Ent. Soc.* ser. 2. iv. p. 247.

ROPICA EXOCENTROIDES. (*Sybra exocentroides*, *Pascoe, ib.* v. p. 61.)

Hab. Queensland.

ATIMURA.

Atimura, *Pascoe, ib.* ser. 3. i. p. 548.

ATIMURA TERMINATA, *Pascoe, ib.* pl. 23. f. 6.

Hab. Port Curtis.

ITHEUM.

Itheum, Pascoe, Journ. of Entom. ii. p. 230.

ITHEUM VITTIGERUM, *Pascoe, ib.*, pl. 11. f. 9.

Hab. South Australia.

I. LINEARE, *Pascoe, ib.*

Hab. South Australia (Adelaide, Port Lincoln).

GENUS NOVUM.

Gen. nov. LEPIDA. (*Anæsthetis lepida, Germar, Linn. Ent.* iii. p. 228.)

Hab. South Australia.

ZYGRITA.

Zygrita, J. Thomson, Essai, &c. p. 69.

Cylindrodema, Cat. name.

ZYGRITA DIVA, *Thomson, ib.* p. 69. (*Zygrita nigro-zonata, var., ejusd.*) *ib.*

Hab. New South Wales; Queensland.

HIPPOPSINÆ.

ESSISUS.

Essisus, Pascoe, antè, p. 90.

ESSISUS DISPAR, *Pascoe, antè,* p. 91.

Hab. Queensland.

TMESISTERNINÆ.

ANASTETHA.

Anastetha, Pascoe, Proc. Ent. Soc. Sept. 1866.

ANASTETHA RARIPILA, *Pascoe, ib.*

Hab. Rockhampton.

TEMNOSTERNUS.

Temnosternus, White, Cat. Long. Brit. Mus. p. 335.

TEMNOSTERNUS PLANIUSCULUS, *White, ib.*, pl. 8. f. 6.

Hab. Queensland.

TEMNOSTERNUS DISSIMILIS, *Pascoe, Trans. Ent. Soc. ser. 2. v.* p. 59.

Hab. Queensland.

CERAMBYCIDÆ.

STENODERINÆ.

BIMIA.

Bimia, White, Proc. Zool. Soc. 1850, p. 13.

BIMIA BICOLOR, *White, ib.*, pl. 13. f. 2.

Hab. Queensland; New South Wales; Victoria; South Australia
Western Australia.

B. FEMORALIS, *W. Wilson Saunders, Trans. Ent. Soc.* ser. 2. i. p. 32,
pl. 4. f. 7.

Hab. —?

ACIPTERA.

Akiptera, *W. W. Saunders, ib.* p. 82.

ACIPTERA SEMIFLAVA, *W. W. Saunders, ib.* p. 83, pl. 4. f. 6.

Hab. —?

A. WATERHOUSEI, *Pascoe, Journ. of Entom.* ii. p. 239, pl. 11. f. 4.

Hab. South Australia.

AGAPETE.

Agapete, *Newman, Zoologist*, iii. p. 1017 (1845).

AGAPETE CARISSIMA, *Newman, ib.*; *W. W. Saunders, Trans. Ent. Soc.*
ser. 2. i. p. 84, pl. 1. f. 2.

Hab. Victoria; New South Wales; South Australia.

A. KREUSLERÆ, *Pascoe, Journ. of Entom.* ii. p. 241.

Hab. South Australia (Gawler).

A. VESTITA, *Pascoe, antè*, p. 91.

Hab. South Australia (Gawler).

EARINIS.

Earinis, *Pascoe, Journ. of Entom.* ii. p. 240.

EARINIS MIMULA, *Pascoe, ib.* p. 241, pl. 11. f. 3.

Hab. South Australia.

E. KREUSLERÆ, *Pascoe, antè*, p. 91.

Hab. South Australia.

EROSCHEMA.

Eroschema, *Pascoe, Trans. Ent. Soc.* ser. 2. v. p. 17.

Octavia, *Thomson, Essai, &c.* p. 146.

EROSCHEMA POWERI, *Pascoe, ib.*, pl. 2. f. 2.

Hab. New South Wales; Victoria; South Australia; Western Australia.

E. ATRICOLLE, *Pascoe, Journ. of Entom.* ii. p. 365.

Hab. Western Australia.

CHAODALIS.

Chaodalis, *Pascoe, ib.* p. 366.

CHAODALIS MACLEAYI, *Pascoe, ib.* p. 367, pl. 16. f. 1.

Hab. New South Wales.

TROPIS.

Tropis, (*Newman*) *Pascoe, Tr. Ent. Soc.* ser. 3. i. p. 568 (1863).

Tropocalymma, *J. Thomson, Syst. Ceramb.* p. 138 (1864).

TROPIS OCUlifera. (*Rhagiomorpha oculifera*, *Newman, Ann. Nat.*
Hist. v. p. 21.)

Hab. Tasmania.

T. DIMIDIATA, *Newman, Entom.* p. 34. (*Tropocalymma dimidiata*,
Thomson, Syst. Ceramb. p. 138.)

Hab. Queensland.

TRITOCOSMIA.

Tritocosmia, *Newman, Zoologist*, 1850, *App.* cxii.

TRITOCOSMIA ROEI. (*Stenoderus Roei*, *Hope, Trans. Ent. Soc.* ser. 1.
i. p. 17, pl. 2. f. 3.)

Hab. Western Australia; New South Wales.

T. ATRICILLA, *Newman, Zool.* 1850, cxv. Var. of *Roei*?

Hab. —?

T. DIGGLESII, *Pascoe, Trans. Ent. Soc.* ser. 2. v. p. 58.

Hab. Queensland.

T. RUBEA, *Pascoe, ib.* p. 24.

Hab. New South Wales.

T. PARADOXA, *Pascoe, ib.* p. 56.

Hab. Victoria; South Australia.

STENODERUS.

Stenoderus, *Serville, Ann. Soc. Ent. de France*, iv. p. 210.

Pterostenus, *Thomson, Essai*, &c. p. 149.

STENODERUS SUTURALIS. (*Stenocorus suturalis*, *Olivier, Entom.* iv.
no. 69, pl. 3. f. 24. *Cerambyx abbreviatus*, *Fabricius, Ent. Syst.*
ii. p. 275. *Leptura ceramboides*, *Kirby, Trans. Linn. Soc.* xii.
p. 472. *Stenoderus labiatus*, *Pascoe, Trans. Ent. Soc.* ser. 2. v. p. 24
(var.).)

Hab. Victoria; South Australia; New South Wales; Western Australia.

S. OSTRICILLA, *Newman, Zool.* 1850, cxiii.

Hab. Queensland.

S. MACULICORNIS, *W. W. Saunders, Trans. Ent. Soc.* ser. 2. i. p. 79,
pl. 4. f. 2.

Hab. North coast.

S. QUIETUS, *Newman, Trans. Ent. Soc.* ser. 2. iv. p. 53.

Hab. Queensland.

S. CONCOLOR, *Macleay, King's Voy.* p. 452.

Hab. Victoria.

SYLLITUS.

Syllitus, *Pascoe, Trans. Ent. Soc.* ser. 2. v. p. 24.

SYLLITUS GRAMMICUS. (*Stenoderus grammicus*, *Newman, Ann. Nat.*
Hist. v. p. 21. *Stenoderus rectus*, *Newman, Entom.* p. 95 (var.).)

Hab. South Australia; Victoria; New South Wales; Western Australia.

S. PARRYI, *Pascoe, Journ. of Entom.* i. p. 366.

Hab. New South Wales?

S. DEUSTUS. (*Stenoderus deustus, Newman, Entom.* p. 95.)

Hab. —?

APHNEOPE.

Aphneope, Pascoe, Trans. Ent. Soc. ser. 3. i. p. 567.

APHNEOPE SERICATA, *Pascoe, ib.* p. 568, pl. 22. f. 1.

Hab. Port Curtis.

ZOËDIA.

Zoëdia, Pascoe, Journ. of Entom. i. p. 361.

ZOËDIA TRIANGULARIS, *Pascoe, ib.* p. 361, pl. 17. f. 3.

Hab. Victoria.

Z. DIVISA, *Pascoe, ib.* p. 362, pl. 17. f. 1.

Hab. Kangaroo Island; Victoria.

AMETROCEPHALA.

Ametrocephala, Blanchard, Gay, Hist. Fis. de Chili, v. p. 480.

Pseudocephalus, Newman, Entom. p. 553 (non Burmeister).

AMETROCEPHALA FORMICIDES. (*Pseudocephalus formicides, Newm. ib.* p. 353.)

Hab. Victoria.

A. ARIETINA. (*Pseudocephalus arietinus, Newman, Zool.* 1851, *Suppl.* cxxxvii.)

Hab. Tasmania.

A. MIRA, *Pascoe, Journ. of Ent.* ii. p. 367.

Hab. Western Australia.

TRICHEOPS.

Tricheops, Newman, Entom. Mag. v. p. 171.

TRICHEOPS EPHIPPIGER, *Newman, ib.* p. 171.

Hab. New South Wales.

MACRONES.

Macrones, Newman, Entom. p. 33.

MACRONES EXILIS, *Newman, ib.*; *W. W. Saunders, Trans. Ent. Soc.* ser. 2. i. p. 78, pl. 1. f. 6.

Hab. Tasmania; South Australia.

M. RUFUS, *W. W. Saunders, ib.* p. 78, pl. 1. f. 8.

Hab. Hunter's River.

M. ACICULARIS, *Pascoe, Journ. of Entom.* i. p. 368.

Hab. South Australia.

M. CAPITO, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 566.

Hab. New South Wales; Port Curtis.

ENCHOPTERA.

Enchoptera, *W. W. Saunders, Trans. Ent. Soc.* ser. 2. i. p. 76.

ENCHOPTERA APICALIS, *W. W. Saunders, ib.* p. 77, pl. 1. f. 7.
Hab. Tasmania.

E. NIGRICORNIS, *W. W. Saunders, ib.* p. 77, pl. 1. f. 5.
Hab. New South Wales.

PSILOMORPHA.

Psilomorpha, *W. W. Saunders, ib.* p. 80.

PSILOMORPHA TENUIPES, *W. W. Saunders, ib.* p. 81, pl. 4. f. 1.
Hab. —?

P. APICALIS, *Pascoe, Trans. Ent. Soc.* ser. 2. v. p. 58.
Hab. Queensland.

P. LUSORIA, *Pascoe, Journ. of Entom.* ii. p. 367. (? *Stenoderus pulcher*, *Hope, Trans. Ent. Soc.* ser. 1. i. p. 18.)
Hab. Queensland.

ORODERES.

Oroderes, *W. W. Saunders, Trans. Ent. Soc.* ser. 2. i. p. 81.

ORODERES HUMERALIS, *W. W. Saunders, ib.* p. 81, pl. 1. f. 3.
Hab. New South Wales; North Australia.

BRACHOPSIS.

Brachopsis, *W. W. Saunders, ib.* p. 97.

BRACHOPSIS CONCOLOR, *W. W. Saunders, ib.* p. 97, pl. 1. f. 4.
Hab. Tasmania.

B. NUPERA, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 565.
Hab. New South Wales.

STEPHANOPS.

Stephanops, *Shuckard, Entom. Mag.* v. p. 509.

Rhinophthalmus, *Thomson, Essai, &c.* p. 152.

STEPHANOPS NASUTUS, *Shuckard, Entom. Mag.* v. p. 510. (Macrones elongaticeps, *Blanchard, Voy. au Pôle Sud*, pl. 16. fig. 8.)
Hab. Tasmania; Victoria; South Australia; New South Wales; Queensland.

RHAGIOMORPHA.

Rhagiomorpha, *Newman, Ann. Nat. Hist.* v. p. 21.

Physodroma, *Thomson, Essai, &c.* p. 150.

RHAGIOMORPHA LEPTUROIDES. (*Stenocorus lepturoides*, *Boisduval, Voy. de l'Astrol.* p. 479. *Physodroma sexcostata*, *Thomson, Essai, &c.* p. 150.)
Hab. New South Wales.

TESSAROMMA.

Tessaromma, *Newman, Ann. Nat. Hist.* v. p. 20.

Meropachys, (*Macleay*) *Hope, Trans. Zool. Soc.* i. p. 197.

TESSAROMMA UNDATUM, *Newman, l. c.* (Meropachys Macleayi, *Hope, l. c.* Meropachys tristis, var. *ej. ib.* Callidium fulvomaculatum, *Blanch. Voy. au Pôle Sud.*)

Hab. South Australia; Victoria; New South Wales.

PHLYCTÆNODES.

Phlyctænodes, *Newman, Ann. Nat. Hist.* v. p. 20.

Trachelorachys, *Hope, Trans. Zool. Soc.* iii. p. 196.

Demacidia, *Thomson, Essai, &c.* p. 246.

PHLYCTÆNODES PUSTULOSUS, *Newman, l. c.* p. 20. (Trachelorachys fumicolor, *Hope, l. c.* p. 196. Demacidia brunnea, *Thomson, l. c.* p. 246.)

Hab. Tasmania.

P. PUSTULATUS. (Trachelorachys pustulata, *Hope, l. c.* p. 196.)

Hab. New South Wales.

P. PILOSUS, *Pascoe, Journ. of Entom.* ii. p. 234.

Hab. South Australia.

DIOTIMA.

Diotima, *Pascoe, Trans. Ent. Soc.* ser. 2. v. p. 57.

DIOTIMA UNDULATA, *Pascoe, ib.* p. 58, pl. 2. f. 9.

Hab. Queensland; New South Wales.

APOSITES.

Aposites, *Pascoe, Journ. of Entom.* ii. p. 363.

APOSITES MACILENTUS, *Pascoe, ib.* p. 364, pl. 16. f. 6.

Hab. South Australia (Gawler).

A. PUBICOLLIS, *Pascoe, antè,* p. 92.

Hab. Western Australia.

BARDISTUS.

Bardistus, *Newman, Entom.* p. 80.

BARDISTUS CIBARIUS, *Newman, ib.* p. 80.

Hab. Western Australia.

NEOSTENUS.

Neostenus, *Pascoe, Trans. Ent. Soc.* ser. 2. iv. p. 91.

Lysestia (♀), *Pascoe, Journ. of Entom.* ii. p. 364.

NEOSTENUS SAUNDERSII, *Pascoe, Trans. Ent. Soc.* ser. 2. iv. p. 91, pl. 22. f. 2. (Lysestia rotundicollis, *Pascoe, Journ. of Entom.* ii. p. 365.

Hab. Victoria; South Australia.

N. MORIO. (*Lysestia morio*, *Pascoe, Journ. of Entom.* ii. p. 365.)
Hab. Western Australia.

MYSTROSA.

Mystrosa, *Pascoe, Journ. of Entom.* ii. p. 239.

MYSTROSA RUBIGINEA, *Pascoe, ib.*, pl. 11. f. 2.

Hab. South Australia.

URACANTHINÆ.

SCOLECOBROTUS.

Scolecobrotus, *Hope, Trans. Zool. Soc.* i. p. 109.

SCOLECOBROTUS WESTWOODII, *Hope, ib.*, pl. 15. f. 5.

Hab. South Australia; Western Australia.

URACANTHUS.

Uracanthus, *Hope, ib.* p. 108.

URACANTHUS TRIANGULARIS, *Hope, ib.*, pl. 15. f. 4. (*Uracanthus angustatus*, *Laporte, Hist. Nat. Ins.* ii. p. 425.)

Hab. Victoria; South Australia.

U. SIMULANS, *Pascoe, antè*, p. 92.

Hab. South Australia.

U. MARGINELLUS, *Hope, Trans. Zool. Soc.* iii. p. 198.

Hab. Western Australia.

U. BIVITTA, *Newman, Entom. Mag.* v. p. 172.

Hab. New South Wales; Queensland.

U. PALLENS, *Hope, Trans. Zool. Soc.* iii. p. 198.

Hab. Tasmania.

U. FUSCO-CINEREUS, *White, Cat. Long. Brit. Mus.* p. 330.

Hab. New South Wales.

U. MINIATUS, *Pascoe, antè*, p. 93.

Hab. Western Australia.

ÆTHIORA.

Æthiora, *Pascoe, Journ. of Entom.* ii. p. 369.

ÆTHIORA FULIGINEA. (*Uracanthus fuliginus*, *Pascoe, ib.* p. 238.)

Hab. South Australia.

TRICHOMESIA.

Trichomesia, *Pascoe, Trans. Ent. Soc.* ser. 2. v. p. 18.

TRICHOMESIA NEWMANII, *Pascoe, ib.* p. 18.

Hab. New South Wales; Victoria; South Australia.

DISTICHOCERINÆ.

DISTICHOCERA.

Distichocera, Kirby, *Trans. Linn. Soc.* xii. p. 471.

DISTICHOCERA MACULICOLLIS, Kirby, *ib.* t. 28. f. 10. (*D. rubripennis*, MacLeay, ♀. *D. ferruginea*, Guérin, ♀. *D. fulvipennis*, Newman, ♀.)
Hab. New South Wales; Victoria.

D. MUTATOR, Pascoe, *Journ. of Entom.* i. p. 370.
Hab. Queensland.

D. PAR, Newman, *Proc. Zool. Soc.* 1851, p. 78. (*Distichocerus fuliginosus*, Blanchard, *Croch. Règne Animal*, pl. 66. f. 4.)
Hab. Victoria; South Australia.

D. THOMSONELLA, White, *Proc. Zool. Soc.* 1859, p. 122, pl. 58. f. 6.
Hab. Victoria; New South Wales; North Australia; South Australia.

D. KIRBYI, Newman, *ib.* 1851, p. 79, pl. 20.
Hab. New South Wales.

D. MACLEAYI, Newman, *ib.* 1851, p. 81.
Hab. New South Wales; Victoria; South Australia.

TRAGOCERINÆ.

TRAGOCERUS.

Tragocerus, Serville, *Ann. Soc. Ent. de France*, iii. p. 60.

TRAGOCERUS BIDENTATUS. (*Prionus bidentatus*, Donovan, *Ins. New Holl.* f. *Tragocerus australis*, Serville, *Ann. Soc. Ent. de France*, iii. p. 61.)
Hab. New South Wales; Victoria.

T. FASCIATUS. (*Prionus fasciatus*, Donovan, *Ins. New Holl.* f. *Tragocerus australis*, Boisduval, *Voy. de l'Astrol.* p. 465, pl. 8. f. 6. *T. bifasciatus*, Guér. *Voy. de la Coq.* pl. 7. f. 3.)
Hab. New South Wales; Victoria.

T. SUBFASCIATUS, Germar, *Linn. Ent.* iii. p. 224.
Hab. South Australia; Victoria.

T. SPENCEI, Hope, *Trans. Ent. Soc.* i. p. 18, pl. 2. f. 4.
Hab. Victoria; New South Wales; South Australia.

T. FORMOSUS, Pascoe, *Ann. & Mag. Nat. Hist.* ser. 3. ix. p. 463.
Hab. Lizard Island.

T. LEPIDOPTERUS. (*Prionus lepidopterus*, Schrebers, *Trans. Linn. Soc.* vi. p. 197, t. 21. f. 7.)
Hab. New South Wales.

PYTHEINÆ.

TELOCERA.

Telocera, *White, Ann. & Mag. Nat. Hist.* ser. 3. ii. p. 354.

TELOCERA WOLLASTONI, *White, ib.* p. 355.

Hab. Queensland.

PYTHEUS.

Pytheus, *Newman, Entom.* p. 14.

PYTHEUS JUGOSUS, *Newman, ib.* p. 14.

Hab. New South Wales.

P. LATEBROSUS, *Newman, ib.* p. 95.

Hab. Kangaroo Island; South Australia; New South Wales.

P. PULCHERRIMUS. (*Brachytria pulcherrima*, *Pascoe, Trans. Ent. Soc.* ser. 2. v. p. 28.)

Hab. Queensland; South Australia.

BRACHYTRIA.

Brachytria, *Newman, Ann. & Mag. Nat. Hist.* v. p. 16.

BRACHYTRIA GULOSA, *Newman, ib.* p. 16; *W. Wilson Saunders, Trans. Ent. Soc.* ser. 2. i. pl. 4. f. 3. (*Callidiomorphus depressus*, *Blanchard, Voy. au Pôle Sud*, pl. 17. f. 3.)

Hab. Tasmania; Victoria; New South Wales; South Australia; Queensland.

B. CENTRALIS, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 564.

Hab. South Australia.

OMOPHCENA.

Omophcena, *Pascoe, Journ. of Entom.* ii. p. 230.

OMOPHCENA KREUSLERÆ, *Pascoe, ib.* p. 231, pl. 11. f. 8.

Hab. South Australia.

O. TÆNIATA, *Pascoe, antè*, p. 93.

Hab. —?

EBUROPHORA.

Eburophora, *White, Cat. Long. Brit. Mus.* p. 332.

EBUROPHORA OCTOGUTTATA, *White, ib.*, pl. 8. f. 7.

Hab. Victoria.

PEMPSAMACRA.

Pempsamacra, *Newman, Entom. Mag.* v. p. 495.

PEMPSAMACRA DISPERSA, *Newman, ib.* p. 495. (*Callidium fulvo-maculatum*, *Blanchard, Voy. au Pôle Sud*, iv. p. 273, t. 16. f. 8.)

Hab. Victoria; South Australia; New South Wales; Queensland.

P. TILLIDES, *Newman, ib.* p. 496.

Hab. New South Wales.

P. VESTITA, *Pascoe, Trans. Ent. Soc.* ser. 2. v. p. 57.

Hab. Victoria.

P. SUBAUREA, *Pascoe, ib.* ser. 3. i. p. 564.

Hab. New South Wales.

P. PYGMÆA, *Newman, Zool.* 1851, cxxviii. (*Lepidisia bimaculata*, *White, Cat. Long. Brit. Mus.* p. 333, pl. 8. f. 9.)

Hab. Victoria; New South Wales; Queensland.

HESTHESINÆ.

HESTHESIS.

Hesthesis, *Newman, Ann. Nat. Hist.* v. p. 17.

HESTHESIS FERRUGINEUS. (*Molorchus ferrugineus*, *Boisduval, Voy. de l'Astrol.* p. 487.)

Hab. New South Wales; Queensland.

H. CINGULATUS. (*Molorchus cingulatus*, *Kirby, Trans. Linn. Soc.* xii. p. 472.)

Hab. Victoria; New South Wales; South Australia.

H. MGERENS, *Pascoe, Trans. Ent. Soc.* ser. 2. v. p. 21.

Hab. New South Wales.

H. MURINUS, *Pascoe, ib.* ser. 3. i. p. 555.

Hab. New South Wales; Western Australia.

H. FLORATOR, *Pascoe, Journ. of Entom.* i. p. 369.

Hab. Victoria.

H. VARIEGATUS. (*Leptura variegata*, *Fabricius, Mant. Ins.* i. p. 108. *Molorchus variegatus*, *Fabricius, Ent. Syst.* ii. p. 357.)

Hab. New South Wales.

H. ORNATUS, *W. Wilson Saunders, Trans. Ent. Soc.* ser. 2. i. p. 84, pl. 1. f. 1.

Hab. New South Wales.

H. BIZONATUS, *Newman, Ann. Nat. Hist.* v. p. 17.

Hab. —?

H. VESPARIUS, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 557.

Hab. —?

H. VIGILANS, *Pascoe, ib.* p. 556.

Hab. Victoria; New South Wales.

H. ACUTIPENNIS, *Pascoe, ib.* p. 556.

Hab. New South Wales.

H. ANGUSTATUS, *Pascoe, ib.* p. 554.

Hab. Western Australia.

OBRINIÆ.

IGENIA.

Igenia, *Pascoe*, *antè*, p. 95.

IGENIA IBIDIONOIDES. (*Obrium ibidionoides*, *Pascoe*, *Trans. Ent. Soc. ser. 2. v. p. 26.*)

Hab. New South Wales.

I. STIGMOSA, *Pascoe*, *antè*, p. 95.

Hab. South Australia.

I. DORSALIS. (*Obrium dorsale*, *Pascoe*, *Journ. of Entom. ii. p. 237.*)

Hab. South Australia.

SIDIS.

Sidis, *Pascoe*, *antè*, p. 93.

SIDIS OPILOIDES, *Pascoe*, *antè*, 94.

Hab. South Australia (Gawler).

ACYRUSA.

Acyrusa, *Pascoe*, *antè*, p. 94.

ACYRUSA CILIATA. (*Obrium ciliatum*, *Pascoe*, *Trans. Ent. Soc. ser. 3. i. p. 559.*)

Hab. New South Wales.

PHALOTA.

Phalota, *Pascoe*, *Trans. Ent. Soc. ser. 3. i. p. 559.*

PHALOTA TENELLA, *Pascoe*, *ib.* p. 560.

Hab. Port Curtis.

P. COLLARIS, *Pascoe*, *antè*, p. 96.

Hab. South Australia (Gawler).

XYSTENA.

Xystena, *Pascoe*, *antè*, p. 96.

XYSTENA VITTATA, *Pascoe*, *antè*, p. 97.

Hab. Queensland.

SISYRIUM.

Sisyrium, *Pascoe*, *antè*, p. 95.

SISYRIUM TRIPARTITUM. (*Obrium tripartitum*, *Pascoe*, *Journ. of Entom. ii. p. 238.*)

Hab. South Australia.

MECYNOPUS.

Mecynopus, *Erichson*, *Wiegmann's Archiv*, 1842, p. 222.

MECYNOPUS COTHURNATUS, *Erichson*, *ib.*, t. 4. f. 10.

Hab. Tasmania.

M. SEMIVITREUS, *Pascoe, Trans. Ent. Soc.* ser. 2. v. p. 56.
Hab. Victoria.

OMOTES.

Omotes, *Newman, Entom.* p. 353.

OMOTES CUCUJIDES, *Newman, ib.*
Hab. Victoria.

O. PUNCTISSIMA, *Newman, Zool.* 1851, cxxix.
Hab. South Australia.

C. EROSICOLLIS, *Pascoe, Trans. Ent. Soc.* ser. 2. v. p. 57.
Hab. Victoria.

CERAMBYCINÆ.

BETHELIUM.

Bethelium, *Pascoe, antè*, p. 97.

BETHELIUM SIGNIFERUM. (*Callidium signiferrum, Newman, Entom.*
 p. 10.)
Hab. Tasmania.

B. INSCRIPTUM. (*Callidium inscriptum, Pascoe, Journ. of Entom.* i.
 p. 363.)
Hab. Queensland.

ELETE.

Elete, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 553.

ELETE INSCRIPTA, *Pascoe, ib.* p. 554, pl. 22. f. 2.
Hab. New South Wales.

SCELETODES.

Skeletodes, *Newman, Zool.* 1850, cxiii.

SCELETODES TETROPS, *Newman, ib.*
Hab. —?

AMPHIROË.

Amphiroë, *Newman, Entom.* p. 24.

AMPHIROË DECORA, *Newman, ib.*
Hab. Queensland ; Tasmania ; South Australia.

CALLIDIOPSIS.

Callidiopsis, *J. Thomson, Syst. Ceramb.* p. 237.

CALLIDIOPSIS SCUTELLARIS. (*Callidium scutellare, Fabricius, Syst.*
El. ii. p. 338. *C. piceum, Newman, Entom.* p. 9.)
Hab. Victoria ; Tasmania.

C. PRÆCOX. (*Stenocorus præcox, Erichson, Wiegmann's Arch.* 1842,
 p. 220.)
Hab. Tasmania.

ATESTA.

Atesta, Pascoe, antè, p. 99.

ATESTA BIFASCIATA. (*Phoracantha bifasciata, Pascoe, Trans. Ent. Soc. ser. 3. i. p. 552.*)

Hab. Port Curtis.

A. BALTEATA. (*Phoracantha balteata, Pascoe, Journ. of Entom. ii. p. 233.*)

Hab. South Australia.

A. ANGASII. (*Phoracantha Angasii, Pascoe, ib. p. 233.*)

Hab. South Australia.

ALLOTISIS.

Allotisis, Pascoe, antè, p. 99.

ALLOTISIS UNIFASCIATA. (*Coptocercus unifasciatus, Hope, Trans. Zool. Soc. iii. p. 195, pl. 12. f. 6.*)

Hab. Western Australia.

A. SCITULA, *Pascoe, Trans. Ent. Soc. ser. 3. i. p. 551.*

Hab. Port Denison.

A. DISCRETA, *Pascoe, ib. p. 551.*

Hab. New South Wales.

EPITHORA.

Epithora, Pascoe, antè, p. 98.

EPITHORA DORSALIS. (*Stenochorus dorsalis, Macleay, App. King's Voyage, ii. p. 451. S. uniguttatus, Hope, Trans. Zool. Soc. iii. p. 193. S. rhombifer, Hope, ib. p. 194. Mallocera elongata, Laporte, Hist. Nat. des An. Art. ii. p. 424. ?Stenochorus angustatus, Boisduval.*)

Hab. Victoria; New South Wales.

CALLIRHOË.

Callirhoë, Newman, Entom. p. 3.

CALLIRHOË BIGUTTATA. (*Stenocorus biguttatus, Donovan, Ins. New Holl. Coptocercus biguttatus, Hope, Trans. Zool. Soc. iii. p. 195, pl. 12. f. 7.*)

Hab. Victoria; New South Wales; Queensland.

C. ALLAPSA. (*Phoracantha allapsa, Newman, Entom. p. 4; Blanchard, Voy. au Pôle Sud, pl. 16. f. 3. Stenochorus Roei, Hope, Trans. Zool. Soc. iii. p. 194. S. rubripes, Boisduval, Voy. de l'Astrol. p. 447.*)

Hab. Tasmania; South Australia; Victoria; Western Australia; New South Wales; Queensland.

C. ABERRANS. (*Phoracantha aberrans, Newman, Entom. p. 4.*)

Hab. New South Wales; Queensland.

C. POLITA. (*Phoracantha polita, Pascoe, Trans. Ent. Soc. ser. 3. i. p. 550.*)

Hab. New South Wales.

C. PEDATOR. (*Phoracantha pedator*, *Pascoe, Journ. of Entom.* ii. p. 232.)
Hab. South Australia.

C. PUBESCENS. (*Phoracantha pubescens*, *Pascoe, Trans. Ent. Soc.*
 ser. 3. i. p. 550.)
Hab. Port Curtis.

PHORACANTHA.

Phoracantha, *Newman, Ann. & Mag. Nat. Hist.* v. p. 19.

Stenochorus, *Hope, Trans. Zool. Soc.* iii. p. 190.

Stenocorus, *Fabricius* (in pt.), *Syst. Entom.* p. 178 (1775) non *Geoffroy*
 (1762).

PHORACANTHA SEMIPUNCTATA. (*Stenocorus semipunctatus*, *Fabricius*,
Syst. Entom. p. 180. *Cerambyx semipunctatus*, *Olivier, Ins.*
 no. 67. p. 38, no. 69. pl. 2. f. 19. *Stenocorus inscriptus*, *Germer*,
Lin. Entom. iii. p. 226.)

Hab. Victoria; New South Wales; South Australia; Western Australia.

P. RECURVA, *Newman, Entom.* p. 4. (*Stenochorus semipunctatus*, *Bois-*
duval, Voy. de l'Astrol. p. 476.)

Hab. South Australia; Victoria; New South Wales.

P. PUNCTATA. (*Stenocorus punctatus*, *Kirby, Trans. Linn. Soc.* xii.
 p. 470.)

Hab. New South Wales; South Australia; Western Australia.

P. LONGIPENNIS. (*Stenochorus longipennis*, *Hope, Trans. Zool. Soc.*
 iii. p. 190.)

Hab. Tasmania.

P. TRICUSPIS, *Newman, Entom.* p. 3. (*Stenocorus robustus*, *Germer*,
Lin. Entom. iii. p. 225. ? *P. impavida*, *Newman, Zool.* 1850, cxiv.)

Hab. New South Wales; South Australia; Victoria.

P. GIGAS, *Hope, ib.* pl. 12. f. 5.

Hab. ? Western Australia.

P. QUINARIA, *Newman, Entom.* p. 3.

Hab. South Australia; Victoria.

P. FALLAX, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 549.

Hab. New South Wales; South Australia; Western Australia.

P. FLAVO-PICTA, *Pascoe, Journ. of Entom.* ii. p. 371.

Hab. South Australia.

P. TRIMACULATA. (*Stenochorus trimaculatus*, *Hope, Trans. Zool. Soc.*
 iii. p. 191, pl. 12. f. 9.)

Hab. Western Australia.

P. HOSPITA, *Pascoe, l. c.* p. 232.

Hab. Queensland.

P. SENIO, *Newman, Entom.* p. 4.

Hab. Victoria; South Australia; New South Wales.

DIOSPIDES.

Diospides, *Pascoe*, *antè*, p. 99.

DIOSPIDES OBSCURA. (*Stenocorus obscurus*, *Donovan*, *Ins. New Holl.*)
Hab. New South Wales; Queensland.

TRYPHOCHARIA.

Tryphocaria, *Pascoe*, *antè*, p. 99.

TRYPHOCHARIA HAMATA. (*Phoracantha hamata*, *Newman*, *Entom.*
p. 3.)

Hab. New South Wales; Victoria.

T. SUPERANS. (*Phoracantha superans*, *Pascoe*, *Journ. of Entom.* i.
p. 357.)

Hab. Tasmania.

T. MITCHELLI. (*Stenochorus Mitchelli*, *Hope*, *Trans. Zool. Soc.* iii. p.
191, pl. 12. f. 8.)

Hab. Western Australia.

T. ODEWAHNII. (*Phoracantha Odewahnii*, *Pascoe*, *Journ. of Entom.*
ii. p. 231.)

Hab. South Australia.

XYPETA.

Xypeta, *Pascoe*, *antè*, p. 100.

XYPETA GRALLARIA. (*Phoracantha grallaria*, *Pascoe*, *l. c.* ii. p. 231.)
Hab. Queensland.

ÆSIOTYCHE.

Æsiotyche, *Pascoe*, *ib.* p. 370.

ÆSIOTYCHE FAVOSA, *Pascoe*, *ib.*, pl. 16. f. 3.

Hab. South Australia (Gawler).

CERAMBYX.

Cerambyx, *Linnæus*, *Syst. Nat.* ed. 12. t. i. pt. 11. p. 261.

Hammaticherus, *Dejean*; *non* Hamaticherus, *Serville*.

Pachydissus, *Newman*, *Ent. Mag.* v. p. 494.

CERAMBYX SERICUS. (*Pachydissus sericus*, *Newman*, *ib.* v. p. 494.

Hammaticherus turbinaticornis, *Germar*, *Lin. Ent.* iii. p. 224.)

Hab. Victoria; South Australia; New South Wales; Western Australia.

C. PICIPENNIS. (*Hammaticherus picipennis*, *Germar*, *ib.* p. 225.)

Hab. South Australia.

C. NUBILUS, *Pascoe*, *Trans. Ent. Soc.* ser. 3. i. p. 558.

Hab. Queensland.

DIDYMOCANTHA.

Didymocantha, *Newman*, *Ann. Nat. Hist.* v. p. 20.

DIDYMOCANTHA OBLIQUA, *Newman, ib.* p. 20. (*Strongylurus vari-*
cornis, *Hope, Trans. Zool. Soc.* iii. p. 199.)

Hab. New South Wales; Queensland.

D. BREVICOLLIS, *Pascoe, antè*, p. 100.

Hab. Western Australia.

STRONGYLURUS.

Strongylurus, *Hope, l.c.* p. 199 (in pt.).

Isalium, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 549.

STRONGYLURUS SCUTELLATUS, *Hope, Proc. Zool. Soc.* 1840, p. 54;

Trans. Zool. Soc. iii. p. 199, pl. 12. f. 2.

Hab. Victoria.

S. CRETIFER. (*Coptopterus cretifer*, *Hope, Trans. Zool. Soc.* iii. p. 200,
pl. 12. f. 3. *Isalium Odewahnii*, *Pascoe, Journ. of Entom.* ii. p. 235,
var.)

Hab. South Australia; Western Australia.

S. THORACICUS. (*Didymocantha thoracica*, *Pascoe, Trans. Ent. Soc.*
ser. 2. iv. p. 98.

Hab. Queensland; New South Wales.

OXYMAGIS.

Oxymagis, *Pascoe, antè*, p. 101.

OXYMAGIS GRAYII, *Pascoe, ib.*

Hab. —?

EXÆRETA.

Exæreta, *Pascoe, Journ. of Entom.* ii. p. 368.

EXÆRETA UNICOLOR, *Pascoe, ib.* p. 369, pl. 16. f. 2.

Hab. South Australia (Gawler).

LYGESIS.

Lygesis, *Pascoe, ib.* p. 369.

LYGESIS CYLINDRICOLLIS. (*Didymocantha cylindricollis*, *Pascoe*,
Trans. Ent. Soc. ser. 2. v. p. 18.)

Hab. Queensland.

BEBIUS.

Bebius, *Pascoe, Journ. of Entom.* ii. p. 369.

BEBIUS FILIFORMIS, *Pascoe, ib.* p. 370.

Hab. South Australia.

PETALODES.

Petalodes, *Newman, Entom.* p. 9.

PETALODES LAMINATUS, *Newman, ib.* p. 9.

Hab. South Australia; Victoria.

P. PLAGIATUS, *White, Ann. & Mag. Nat. Hist.* ser. 3. ii. p. 354, note.
Hab. ? South Australia.

OPSIDOTA.

Opsidota, *Pascoe, Journ. of Entom.* ii. p. 235.

OPSIDOTA INFECTA, *Pascoe, ib.* p. 236, pl. 11. f. 6.
Hab. South Australia.

O. ALBIPILOSA, *Pascoe, antè*, p. 101.
Hab. South Australia.

PIESARTHRIUS.

Piesarthrius, *Hope, Trans. Zool. Soc.* iii. p. 200.

PIESARTHRIUS MARGINELLUS, *Hope, ib.* iii. p. 200, pl. 12. f. 1.
Hab. Western Australia; Victoria.

CERESIUM.

Ceresium, *Newman, Entom.* p. 322.

Diatomocephala, *Blanchard, Voy. au Pôle Sud*, iv. p. 266.

CERESIUM SIMPLEX. (*Stenochorus simplex*, *Gyllenhal, in Schön. Syst. Ins. App.* i. 3. p. 178. *Callidium vile*, *Newman, Entom.* p. 223. *Cemona Philippensis*, *Newman, ib.* p. 247, fide *White*. *Arhopalus ambiguus*, *Newman, ib.* p. 246, fide *White*. *Diatomocephala maculaticollis*, *Blanchard, Voy. au Pôle Sud*, iv. p. 267, pl. 16. f. 9. *D. simplex*, *White, Cat. Long. Brit. Mus.* p. 305.)

Hab. —? (Generally distributed from Burmah to the Philippine Islands; perhaps questionable as from Australia.)

PAPHORA.

Paphora, *Pascoe, antè*, p. 102.

PAPHORA MODESTA. (*Ceresium? modestum*, *Pascoe, Journ. of Entom.* ii. p. 237.)

Hab. South Australia.

PORITHEA.

Porithea, *Pascoe, antè*, p. 102.

PORITHEA INTORTA. (*Callidium intortum*, *Newman, Entom.* p. 223.)
Hab. —?

APHANASIUM.

Aphanasium, *Thomson, Essai, &c.* p. 300.

Solimnia, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 557.

APHANASIUM AUSTRALE. (*Callidium Australe*, *Boisduval, Voy. de l'Astrol.* ii. p. 480; *Thomson, Essai, &c.* p. 300. *Solimnia sublineata*, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 558, pl. 22. f. 3.)

Hab. South Australia; New South Wales.

TAPHOS.

Taphos, *Pascoe, Journ. of Entom.* ii. p. 236.

TAPHOS ATERRIMUS, *Pascoe, ib.* pl. 11. f. 7.

Hab. South Australia.

IBIDIONINÆ.

ISCHNOTES.

Ischnotes, *Newman, Ann. Nat. Hist.* v. p. 18.

ISCHNOTES CYLINDRACEUS, *Newman, ib.* p. 18.

Hab. South Australia.

I. BAKEWELLII, *Pascoe, Trans. Ent. Soc.* ser. 2. v. p. 56.

Hab. Victoria.

CLYTINÆ.

CLYTANTHUS.

Clytanthus, *Thomson, Syst. Ceramb.* p. 190.

Anthoboscus, Chevrolat (non Guérin).

CLYTANTHUS CURTISII. (*Clytus Curtisii, Laporte et Gory, Mon. du Genre Clytus*, p. 49, pl. 10. f. 56 bis.)

Hab. Queensland.

C. GLAUCINUS. (*Clytus glaucinus, Boisduval, Voy. de l'Astro.* ii. p. 483. *Laporte et Gory, Mon. Genre Clytus*, p. 98, pl. 18. f. 117.)

Hab. —?

C. CHRYSODERES. (*Clytus chrysoderes, White, Cat. Long. Brit. Mus.* p. 285.)

Hab. Queensland.

C. ANNULARIS. (*Callidium annulare, Fabricius, Mant. Ins.* i. p. 156; *Ent. Syst.* ii. p. 337; *Olivier, Entom.* iv. no. 70. p. 48, pl. 6. f. 74.

Hab. "Port Jakson," fide *Boisduval*.

XYLOTRECHUS.

Xylotrechus, *Chevrolat, Ann. Soc. Ent. de France*, 1860, p. 456.

XYLOTRECHUS AUSTRALIS. (*Clytus Australis, Laporte et Gory, Mon. du Genre Clytus*, p. 99, pl. 19. f. 118.)

Hab. Queensland.

CREMYS.

Cremys, *Pascoe, Journ. of Entom.* ii. p. 246.

CREMYS DIOPHTHALMUS. (*Clytus diophtthalmus, Pascoe, ib.* i. p. 358.)

Hab. Queensland.

ARIDÆUS.

Aridæus, *Thomson, Essai, &c.* p. 228.

ARIDÆUS THORACICUS. (*Clytus thoracicus*, *Donovan, Ins. of New Holl.; Laporte et Gory, Mon. du Genre Clytus*, p. 50, pl. 10. f. 58.)
Hab. New South Wales; Queensland.

A. HEROS, *Pascoe, antè*, p. 103.

Hab. Port Albany.

TYPHOCESES.

Typhocesis, *Pascoe, Trans. Ent. Soc. ser. 3. i.* p. 561.

TYPHOCESES MACLEAYI, *Pascoe, ib.* p. 562, pl. 23. f. 4.

Hab. Port Denison; Rockhampton.

HEMISTHOCERA.

Hemisthocera, *Newman, Zool.* 1850, cxi.

HEMISTHOCERA FLAVILINEA, *Newman, ib.*; *White, Cat. Long. B. M.* pl. 6. f. 2.

Hab. Northern Australia.

OBRIDA.

Obrida, (*White*) *Pascoe, Journ. of Entom. ii.* p. 360 (note).

OBRIDA FASCIALIS. (*Clytus* (*Obrida*) *fascialis*, *White, Stoke's Discov. in Australia*, i. p. 510, pl. 2. f. 4.)

Hab. Victoria; New South Wales.

O. COMATA, *Pascoe, Journ. of Entom. ii.* p. 50.

Hab. Queensland.

HOMÆMOTA.

Homæmota, *Pascoe, ib.* p. 371.

HOMÆMOTA BASALIS, *Pascoe, ib.* p. 372.

Hab. Western Australia (Perth).

H. DUBOULAYI, *Pascoe, antè*, p. 103.

Hab. Western Australia.

TILLOMORPHA.

Tillomorpha, *Blanchard, in Gay, Hist. Fis. de Chili*, v. p. 482.

TILLOMORPHA MÆSTULA, *White, Cat. Long. Brit. Mus.* p. 290.

Hab. Queensland.

ECTOSTICTA.

Ectosticta, *Pascoe, antè*, p. 104.

ECTOSTICTA CLEROIDES. (*Callidium cleroides*, *White, Cat. Long. Brit. Mus.* p. 322. *C. simillimum*, *White, ib.* [var.?].)

Hab. Victoria; Western Australia; South Australia.

E. RUIDA, *Pascoe, antè*, p. 104.

Hab. Champion Bay.

E. EBURATA. (*Callidium eburatum*, *Pascoe*, *Trans. Ent. Soc.* ser. 3. i. p. 563.)

Hab. New South Wales?

IPOMORIA.

Ipomoria, *Pascoe*, *antè*, p. 104.

IPOMORIA TILLIDES, *Pascoe*, *antè*, p. 105.

Hab. South Australia.

ADRIUM.

Adrium, *Pascoe*, *antè*, p. 105.

ADRIUM CATOXANTHUM. (*Callidium catoxanthum*, *White*, *Cat. Long. Brit. Mus.* p. 323.)

Hab. —?

A. ARTIFEX. (*Callidium artifex*, *Newman*, *Entom.* p. 353. *C. terebrans*, *Newman*, *ib.* [var. ?]. *C. cucujus*, *White*, *l.c.* p. 323.)

Hab. South Australia; Victoria.

SOPHRON.

Sophron, *Newman*, *Entom.* p. 354.

Clæadne, *Pascoe*, *Trans. Ent. Soc.* ser. 3. i. p. 560.

SOPHRON INORNATUS, *Newman*, *l.c.* p. 354. (*Clæadne melanaria*, *Pascoe*, *l.c.* p. 561, pl. 23. f. 5.)

Hab. New South Wales; South Australia; Victoria.

S. EBURATUS, *Pascoe*, *Journ. of Entom.* ii. p. 374.

Hab. South Australia.

CERASPHORINÆ.

PHACODES.

Phacodes, *Newman*, *Entom.* p. 7.

PHACODES OBSCURUS. (*Callidium obscurum*, *Fabricius*, *Ent. Syst.* i. pt. 11. p. 318; *Olivier*, *Coléopt.* iv. no. 70, pl. 4. f. 45. *Phacodes lentiginosus*, *Newman*, *l.c.* p. 7.)

Hab. Tasmania; New South Wales; Western Australia.

P. ESSINGTONI. (*Callidium Essingtoni*, *Hope*, *Ann. & Mag. Nat. Hist.* 1842, ix. p. 429.)

Hab. Port Essington.

P. PERSONATUS, *Erichson*, *Wiegmann's Arch.* 1842, p. 221.

Hab. Tasmania; New South Wales.

P. FERRUGINEUS, *Pascoe*, *Journ. of Entom.* ii. p. 238.

Hab. South Australia.

P. MOSSMANI, *Newman*, *Zool.* 1850, *App.* cxxiv.

Hab. South Australia.

P. ELUSUS, *Pascoe, Journ. of Entom.* ii. p. 373.

Hab. South Australia.

P. FUSCUS, *Pascoe, ib.* p. 373.

Hab. South Australia.

P. DISTINCTUS, *Pascoe, ib.* p. 373.

Hab. South Australia.

Thersalus.

Thersalus, *Pascoe, ib.* p. 372.

THERSALUS BISPINUS. (*Phacodes bispinus*, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 562.)

Hab. —?

Æbarina.

Æbarina, *Pascoe, antè*, p. 105.

ÆBARINA TRISTIS, *Pascoe, antè*, p. 106.

Hab. South Australia.

Æ. CERESIOIDES, *Pascoe, antè*, p. 106.

Hab. South Australia.

Xystrocera.

Xystrocera, *Serville, Ann. Soc. Ent. de France*, ii. p. 69.

XYSTROCERA VIRESCENS, *Newman, Ann. & Mag. Nat. Hist.* v. p. 19.

Hab. Victoria; South Australia.

X. AUSTRALASIÆ, *Hope, Ann. & Mag. Nat. Hist.* 1842, ix. p. 429.

Hab. Port Essington.

CALLICHROMINÆ.

Callichroma.

Callichroma, *Latreille, Règ. An.* v. p. 113.

CALLICHROMA CINDERELLA, *White, Cat. Long. Brit. Mus.* p. 156.

Hab. North coast.

PURPURICENINÆ.

Purpuricenus.

Purpuricenus, *Serville, Ann. Soc. Ent. de France*, ii. p. 568.

Cyclodera, *White, Stokes's Discoveries in Australia, App.* i. p. 510.

PURPURICENUS ANGASII. (*Purpuricenus* (*Cyclodera*), n. s., *White, Angas's South Australia Ill.* pl. 50. f. 17; *Cyclodera Angasii*, *White, Cat. Long. Brit. Mus.* p. 140. *P. Australicus*, *Thomson, Essai*, p. 203.)

Hab. New South Wales; South Australia.

- P. QUADRINOTATUS. (*Cyclodera quadrinotata*, *White, Stokes's Discoveries in Australia*, i. p. 510, pl. 2. f. 6.)
Hab. Percy Islands; South Australia (Gawler); Queensland.

CALLIDIINÆ.

HYLOTYPES.

Hylotrupes, (*Serville*) *Mulsant, Long. de Fr.* p. 55.

HYLOTYPES ASEMOIDES. (*Callidium asemoides*, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 563.
Hab. South Australia.

PRIONIDÆ.

IOThERIUM.

Iotherium, *Pascoe, ib.* p. 569.

IOThERIUM METALLICUM. (*Pœcilosoma metallicum*, *Newman, Ent. Mag.* v. p. 493.)

Hab. Tasmania; Victoria; New South Wales.

PHAOLUS.

Phaolus, *Pascoe, Trans. Ent. Soc.* ser. 3. i. p. 569.

PHAOLUS MACLEAYI, *Pascoe, ib.* p. 569, pl. 23. f. 3.

Hab. New South Wales.

SCELEOCANTHA.

Sceleocantha, *Newman, Ann. Nat. Hist.* v. 14.

SCELEOCANTHA GLABRICOLLIS, *Newman, ib.* p. 15.

Hab. Tasmania.

S. PILOSICOLLIS. (*Prionus pilosicollis*, *Hope, Trans. Ent. Soc.* ser. 1. i. p. 16, pl. 11. f. 1.)

Hab. Western Australia.

TOXEUTES.

Toxeutes, *Newman, Ann. Nat. Hist.* v. p. 15 (1840).

Oncinotus, *Erichson, Wiegmann's Archiv*, 1842, p. 219.

TOXEUTES ARCUATUS. (*Prionus arcuatus*, *Fabricius, Syst. El.* ii. p. 259; *Olivier, Ent.* iv. p. 34. no. 66, pl. 10. f. 38.)

Hab. Tasmania.

RHIPIDOCERUS.

Rhipidocerus, *Westwood, Trans. Ent. Soc.* ser. 1. iii. p. 70.

RHIPIDOCERUS AUSTRALASIÆ, *Westwood, ib.*, pl. 3. f. 5.

Hab. — ?

MACROTOMA.

Macrotoma, *Serville, Ann. Soc. Ent. de France*, i. p. 137.

MACROTOMA SPINICOLLIS. (*Prionus spinicollis*, *Macleay in King's Survey*, App. ii. p. 449. *Mallodon Australis*, *Boisd. Voy. de l'Astrol.* ii. p. 465.)

Hab. Clarence River.

M. GEMELLA, *Pascoe, Trans. Ent. Soc.* ser. 2. v. p. 15.

Hab. New South Wales.

M. PAPYRIA, *Pascoe, Journ. of Entom.* ii. p. 244.

Hab. South(?) Australia.

M. AUSTRALIS, *Erichson, Wiegmann's Archiv*, 1842, p. 218.

Hab. Tasmania.

CATYPNES.

Catypnes, *Pascoe, Journ. of Entom.* ii. p. 243.

CATYPNES MACLEAYI, *Pascoe, ib.* p. 244.

Hab. Richmond River.

MALLODON.

Mallodon, *Serville, Ann. Soc. Ent. de France*, i. p. 137.

MALLODON INSULARE, *Hope, Ann. & Mag. Nat. Hist.* 1842, ix. p. 428.

Hab. Port Essington.

M. FIGURATUM, *Pascoe, Trans. Ent. Soc.* ser. 2. v. p. 14.

Hab. New South Wales.

M. STIGMOSUM, *Newman, Ann. Nat. Hist.* v. p. 15.

Hab. —?

M. ODEWAHNII, *Pascoe, Journ. of Entom.* ii. p. 242.

Hab. South Australia.

M. CEPHALOTES, *Pascoe, ib.* p. 242.

Hab. Queensland.

M. EDULE. (*Cnemoplites edulis*, *Newman, Entom.* p. 351.)

Hab. Victoria.

M. JEJUNUM, *Pascoe, l.c.* p. 243.

Hab. Richmond River.

NOTOPHYSIS.

Notophysis, *Serville, Ann. Soc. Ent. de France*, i. p. 158.

NOTOPHYSIS LUCANOIDES, *Serville, ib.* p. 159.

Hab. South Australia (Gawler); Kangaroo Island.

The following is a list of doubtful species, either unknown to me, or probably erroneously enumerated as Australian; a few may be identical with some of the foregoing:—

MONOPLIA TETRA, *Newman, Zool.* iii. p. 1016 (1845).

- ANCITA CROSSOTOIDES, *Thomson, Syst. Ceramb.* p. 64.
 LAMIA PETRORHIZA, *Boisduval, Voy. de l'Astrol.* p. 502.
 L. PICTA, *Leach, Zool. Misc.* i. p. 14, pl. 4 (? Rhytiphora).
 MONOCHAMUS DESPERATUS, *Thomson, Arch. Ent.* i. p. 295.
 M. TOGATUS, *Perroud, Ann. Soc. Linn. de Lyon*, n. s. ii. p. 341 (1856).
 MORIMUS LUCTUOSUS, *Shuckard, Ent. Mag.* v. p. 510 (? Microtragus).
 GNOMA GIRAFFA, *Schreibers (Cerambyx), Trans. Linn. Soc.* 1801, p. 198.
 OLENECAMPTUS BILOBUS, *Fabricius (Saperda), Syst. Eleuth.* ii. p. 324.
 XYLOTOLES GRISEA, *Fabricius (Saperda), Syst. Eleuth.* ii. p. 324.
 OOPSIS NUTATOR, *Fabricius, Syst. El.* ii. p. 304 (Lamia).
 ISOSCELES PIGRA, *Newman, Zool.* 1851, cxxxi.
 COPTOMMA TEXTORIUM, *Newman, Ann. Nat. Hist.* v. p. 18.
 C. VIRGATUM, *Newman, ib.* p. 18.
 ENICODES FICHTELII, *Schrader (Cerambyx), Trans. Linn. Soc.* vi. p. 200.
 GLAUCYTES GRAPHICUS, *Boisduval (Leptocera), Voy. de l'Astrol.* p. 611, pl. 9. f. 17.
 LEPTOCERA VITTIFERA, *Buquet in Guérin, Icon. Ins.* p. 250.
 RHAGIOMORPHA UNICOLOR, *Hope, Ann. Nat. Hist.* ix. p. 429.
 R. PLAGIATA, *Hope, ib.*
 R. SORDIDA, *Newman, Ann. Nat. Hist.* v. p. 21.
 NECYDALIS AURICOMUS, *Newman, Ann. Nat. Hist.* v. p. 16.
 HELIOMANES SIDUS, *Newman, ib.* p. 17.
 CERAMBYX? LATIVITTA, *Newman, Zool.* 1850, cxv.
 C.? SUBSERRATUS, *Newman, ib.* cxvi.
 CALLIRHOË DECORA, *Perroud, Ann. Soc. Linn. de Lyon*, n. s. 1856, p. 371 (? biguttata, Don.).
 COPTOCERCUS SEXMACULATUS, *Hope, Trans. Zool. Soc.* iii. p. 195.
 PHORACANTHA GRACILIS, *Perroud, ib.* (? senio, Newm.).
 P. IMBELLIS, *Newman, Entom.* p. 352 (? Epithora dorsalis, MacL.).
 STENOCHORUS ACANTHOCERUS, *Hope, Trans. Zool. Soc.* iii. p. 193.
 S. LATUS, *Hope, ib.* p. 190.
 S. TUNICATUS, *Hope, ib.* p. 194.
 S. UNDULATUS, *Hope, ib.* p. 192.
 S. ASSIMILIS, *Hope, ib.* p. 193.
 S. VICINUS, *Hope, Ann. Nat. Hist.* ix. p. 248.
 S. CRUCIGER, *Hope, ib.*
 PLOCÆDERUS AUSTRALASIÆ, *Hope, ib.*

CLYTUS SEX-MACULATUS, *Donovan, Ins. New Holl.* pl. 5. f.

C. ATTENUATUS, *Boisduval, Voy. de l'Astrol.* p. 485.

C. V-ALBUM, *Boisduval, ib.* pl. 9. f. 23 (? *Zoedia*).

CALLIDIUM EROSUM, *Macleay, King's Voy. App.* ii. p. 450.

C. FABER, *Newman, Ann. Nat. Hist.* v. p. 18.

C. AUSTRALE, *Boisduval, Voy. de l'Astrol.* ii. p. 480.

C. MOROSUM, *Boisduval, ib.* p. 480.

C. FUNESTUM, *Boisduval, ib.* p. 480.

C. FLAVOMACULATUM, *Blanchard, Voy. au Pôle Sud*, iv. p. 273, pl. 16. f. 8.

PHYMATODES* VARIABILIS, *Linnæus, Faun. Suecica*, 669, p. 192 (introduced).

HYLOTYPES BAJULUS, *Linnæus, ib.* 672, p. 193 (introduced).

PITHANOTES FALSUS, *Newman, Ann. Nat. Hist.* v. p. 16 = ♀ *Cacosceles Œdipus*.

DORX PENTAMERA, *Newman, ib.* p. 16.

The following new genera and species of *Prionidæ* have been published by M. J. Thomson. They are unknown to me; but some of them may probably be identical with those enumerated in the List:—

ARIMASPES HOWEI, *Syst. Ceramb.* p. 302.

DIACLIDES PRIONOIDES, *ib.* p. 303.

EURYNOSSA SERVILLEI, *ib.* p. 304.

TEISPES DORSALIS, *ib.* p. 305.

EXPLANATION OF THE PLATES.

TAB. III.

Fig. 1. *Allotisis discreta*.

2. *Oxymagis Grayii*.

3. *Igenia stigmosa*.

4. *Essisus dispar*.

5. *Zygocera pentheoides*.

6. *Neissa inconspicua*.

7. *Hathliodes grammicus*.

8. *Aposites pubicollis*.

9. *Microtragus sticticus*.

TAB. IV.

Fig. 1. *Ipomoria tillides*.

2. *Xypeta grallaria*.

3. *Sidis opiloides*.

4. *Sisyrium tripartitum*.

5. *Atesta bifasciata*.

6. *Paphora modesta*.

7. *Tryphocharia Odewahnii*.

8. *Xystena vittata*.

[ERRATUM, *antè* p. 96, line 1, after former read except in its broad prothorax.]

* The heteromerous genus *Phymatodes* of M. Blanchard was described some years after M. Mulsant had used the same word for the Longicorn genus. I have therefore to propose that M. Blanchard's name be changed to *Phymatestes*.

Stray Notes on some of the smaller Crustaceans. Note I. On the Habits &c. of the *Hyperiidæ*. By THOMAS EDWARD, A.L.S.

[Read June 21, 1866.]

It would appear, from works on this department of the animal kingdom, that carcinologists are unanimously of opinion that the *Hyperiidæ* are parasitical in their habits. And in the most recent monograph on the subject we are told that the species are found to exist only in the gill-cavities of *Medusæ*, though they are also occasionally found on fish.

From this I in a great measure dissent. That some of the species are at times found in *Medusæ* I know. But is the *Medusa* their true habitat? I believe rather that, instead of being their natural abode, it is simply a place occasionally chosen for convenience' sake, or to suit existing circumstances as it were. But, since I have no wish to interfere with the ideas or researches of others, I shall in my remarks confine myself more particularly to what has come under my own observation.

Before discussing the habits of the species, I would here say a few words as to the sexes, so as to save time and useless repetition.

I consider the genus *Lestrignonus* of Milne-Edwards and subsequent writers to be nothing more nor less than the male of *Hyperia*. I am led to this conclusion from the remarkable similitude which exists among them, and from the fact that, in all the species (*five in number*) which I have met with, the sexes have always been associated, except in the case of *Lestrignonus Kinahani*. I have not, as yet, been able to detect a female for him, but have no doubt whatever of the others. It may here be mentioned that I speak only of those I have myself found. For my own part I have little or no difficulty whatever in tracing, almost from the ovary of the parent up to a state of maturity, *Lestrignonus exulans* as the male of *Hyperia galba*. The differences between the two are so slight as scarcely to be worth noticing, except perhaps in a sexual point of view. Their external appearance is almost the same, both in form and colour; and in habits they are wholly alike.

The same may be said of *H. olivia* and *H. medusarum*, the males of which have not yet been described, but both of which I have lately discovered, and which must, as a matter of course, be called *Lestrignonus*,—and also another species, believed to be new, and not yet named, and smaller than the last, which we shall here, but only for convenience' sake, as it is in the hands of another to

name, call *H. minuta*. The males of all these, I say, can be clearly and satisfactorily defined; at least, so it appears to me. So confident am I in this, that those I have in my own collection are so arranged, and marked male and female.

The only species (as I have already said) to which I have not yet been able to assign a female is *L. Kinahani*. I thought I had discovered the desideratum once; but unhappily the specimens were lost before the examination and comparisons were completed.

Although this species may be, and is occasionally, found in company with *H. galba*, the one is easily distinguishable from the other. They are nothing alike, either in form or colour; not to speak of the long and remarkably slender antennæ of the one in comparison with those of the other. *H. Kinahani* is longish, more shrimp-like, especially behind, and not so round and dumpy as *H. galba*, and the colour is always much darker. The eyes, too, are dark instead of being of a light green. I am speaking of the living animal; for the figures which I have seen all appear to me to have been taken from rolled up and contracted specimens.

From these circumstances, then, we shall, for the present, lay aside the term *Lestrigonus*—except in the case of *L. Kinahani*, which must remain as he is in the meantime—and adopt that of *Hyperia*, and, when referring to the sexes, simply use the designation of *male* or *female* as occasion may require.

I have already said that it is the general belief amongst carcinologists that the animals composing this family are parasitical in their habits, and have never been found but on the *Medusa* and on fish.

This does not exactly agree with my experience; for I have taken all the five species mentioned swimming free. I do occasionally find *L. Kinahani* and *H. galba* in a *Medusa*, but have never as yet met with any of them attached to fish.

But, as already observed, is the *Medusa* or even a fish their real and true habitat? I rather think not; and my reason is this: they appear to me, although they do occasionally come inshore, to be what I would call an out- or deep-sea and a wandering genus. Now, from this circumstance, I believe that on coming in contact with the gill-cavities of the *Medusa*, and finding them a convenient and, perhaps, in some measure a comfortable receptacle, some may for a time avail themselves of the opportunity thus afforded of being carried through the water at the expense of another.

I am not yet certain whether the two species alluded to be animal feeders or not. If they are, as I know others of the family to be, then they may have two other objects in view in affixing themselves on the *Medusa*—one being shelter from their enemies (if they have any), and the other to obtain food. It is not at all impossible, but, as I think, rather probable, that other and much more minute animals, or something else congenial to their tastes, may exist in certain species of *Medusa*, and that these may attract and afford them abundant and savoury food. When in these retreats, I have frequently observed, with the aid of a glass, that their swimming-feet, as well as, sometimes, the others, but more particularly the former, were kept almost continually in motion. I could also occasionally see the mandibles and other appendages of the mouth moving. This was particularly the case with *H. galba*. From these circumstances I have been at times led to conclude that they were then in the act of feeding.

But whether I am right in these conjectures or not, I know that they can and do leave the *Medusa* at will, or when occasion suits them. I have often seen them do so, both in the water and on the land. In the latter case, and when the *Medusa* has been stranded for a little, they will come out, and, toppling over and over, roll hither and thither in the most awkward manner; for decidedly they can neither stand on their feet, nor walk, nor even crawl. But should they in thus tumbling headlong about again by chance reach their own element, they will then dart away like an arrow, seemingly taking no count as to the fate of the gelatinous friend that bore them to the shore. I have also taken them from the *Medusa*, and placed both in a pool, to see if they would again seek to enter. On these occasions a few of the smaller would do so; but the majority never did. They invariably kept swimming about without paying the least attention to the *Medusa*, and if an outlet could be found, off they went once more to sea. I have myself, when the tide was rising, cut channels in the sand to allow the water to run in instead of out, to see how they would then act. It was all one whether the water came in or went out; for whenever they got to the opening, away they sped. Not content with this, I have taken them home to try them there; but although the *Medusa* thrive well enough for a time, the *Hyperia* never did; and, unlike the case of the rock-pools, under these circumstances I never saw any of them attempt to return to the *Medusæ*, but they kept continually

swimming about, sometimes rolling themselves up, and in that position would fall to the bottom, where, having lain for a little, they would start up and begin swimming again.

I could never get either of these forms to eat, although I have kept them for that purpose, and with the view of ascertaining what their food might be. They in fact seldom rested long enough to allow of anything of the kind. *Lestrignus Kinahani*, however, always appeared more docile, if I may use the phrase, and was never so restless as *H. galba*. Yet the whole aim of both, however large the vessel in which they were confined, seemed to be to regain their liberty and be once more in the free ocean. This being denied them they generally died in about two days, and sometimes sooner. I have placed various substances (in addition to marine productions), such as wood, cork, &c., in the vessel with them, but I never saw any of them pay the least attention or attach themselves to anything. A few once, but it was only for a little while, concealed themselves in the folds of a piece of paper; but that was the only instance of the kind I ever saw. Restless apparently in manners, though not quite so active and wild as some of their congeners, still their constant habit, as I have already hinted, was to swim about, with the additional trait of rolling themselves up occasionally like a ball, sinking to the bottom, where, after resting for a little, they would again stretch themselves out and resume their former occupation.

But although I have stated at some length the facts concerning the *Medusa* and some of its so-called parasites, I am not inferring whether they prove or disprove anything—that is, whether the *Hyperia* be parasitical or not. That the experiments, as will be observed, were in most cases made at what may be called a disadvantage to the animals, I freely confess, also that they were done merely to satisfy my own insatiable curiosity. Still I consider the circumstances worth recording, especially where they may meet the notice of those who, like myself, take an interest in these things; for we not unfrequently see that what are at times considered to be nothing but worthless and insignificant incidents, often turn out in course of time productive of very important and valuable results. Something of this kind may accrue from my observations, as they may, I hope, be the means of stimulating others to investigate the matter more fully and with greater diligence.

It is also worthy of notice that, of the two species of *Hyperia* which I have found in the *Medusa*, *H. galba* has always been the

more numerous, and that by far the greatest number have been young and immature specimens. I have counted as many as thirty in one *Medusa*, and only a few of these were adults. In other instances, however, and that too of the most common occurrence, the numbers would vary from one up to about a dozen. But it must not be taken for granted from this that every *Medusa* has its *Hyperia*. This is by no means the case. I have seen multitudes without any.

As for *Lestrigonus Kinahani*, the forms so named are ever the fewest thus met with cooped up, and all have seemingly arrived at a state of maturity. I have never yet seen a young or small example of this species in a *Medusa*, but have taken them free. There appears to be little or no difference between the young and the old. They are both slender, and of a dark lead-colour, and both have the remarkable long and hair-like antennæ.

But besides these I have likewise taken *Anonyx Edwardsii*, *Dexamine spinosa*, *Atylus Swammerdamii*, *A. bispinosus*, *Eurydice pulchra*, and once a small specimen of *Portunus marmoreus* from *Medusæ*; yet who would ever think of calling these creatures parasitical? Carcinologists do not, neither will we—although some of them may have occasionally been seen taking a quiet ride on the back of some of the smaller *Medusæ*.

It will be seen from the foregoing that only two species, viz. *L. Kinahani* and *H. galba* (m. & f.), have been in a measure particularly alluded to. The others will form the subject of and be more fully treated in another Note.

On the Surface-fauna of mid-Ocean. By Major SAMUEL R. I. OWEN, F.L.S., F.A.S.L., F.M.S.L., Associate of King's College, London.

[Read June 7, 1866.]

[PLATE V.]

NO. 2.—FORAMINIFERA.

In a paper read before the Society and published in vol. viii. of the 'Journal,' (page 202) I mentioned that I had found some genera of the Foraminifera living on the surface of the ocean. I wish in my present communication to give the names of the species and the localities in which I have met with these Rhizopods, together with such other observations on them as may appear worth

recording. Like their kindred the Polycystina, they appear on the surface after sunset. All that I have hitherto met with have been, as might be expected, of the unattached forms, and they are all included in the two genera *Globigerina* and *Pulvinulina*.

To *Orbulina*, which likewise is constantly met with on the surface, I shall refer presently.

All the varieties of form of *Globigerina*, in Mr. Parker's opinion, may be included in two or three subspecies; *G. bulloides*, *G. inflata*, and *G. hirsuta*.

Of the genus *Pulvinulina*, *P. Menardii* is the principal representative. *P. Micheliniana* is met with somewhat more rarely. *P. canariensis*, which the same authority considers to be but a starved-out form of *P. Micheliniana*, is also found. *P. crassa*, an Old Chalk form, I have met with in the South Atlantic. These two genera both belong to the second family, Globigerinidæ, of Dr. Carpenter's suborder Perforata.

I have never met with any trace, not so much as a single individual, of the Imperforata, or of the families Lagenidæ and Nummulinidæ of the Perforata. Thus we find one genus of the subfamily Rotalinæ, and one genus of the subfamily of the Globigerinæ, alone making the surface of the ocean their home.

I have never met with any form of the subfamily Textularinæ.

With regard to *Orbulina*, Dr. Carpenter in his work 'An Introduction to the Foraminifera,' at p. 177, states that it has been considered to be but a development of *Globigerina*, and that the young of that genus have been found within it; in fact it is but a form of *Globigerina*. I think he is quite correct, with the exception that it does not contain the young of that genus: a few small chambers attached to each other, precisely as in the commonest form of *G. bulloides*, which are generally of a size inconsiderable compared with the outer sphere, are all that are found inside it; they are firmly attached to its inner surface, and I consider them to be its own proper chambers.

Orbulina may have no internal chambers; sometimes it has two or three, at other times many may be found within.

I have not met with any *Orbulinæ* that have a large aperture externally; but their whole surface is perforated with smaller and larger openings for the passage of the sarcode. Dr. Wallich in his 'North Atlantic sea-bed,' mentions his having found an Annelid at the bottom of the deep sea, to which he gives the credit of boring the shells of the *Globigerinæ*. I fancy it quite likely that the holes found in the *Orbulina* may be due to the same cause.

The outer sphere may be regarded as a wild-growing closing-in chamber; this form of growth is at times imitated by *Pulvinulina*, the outer chambers of which species then take on the same texture as is common to the outer chambers of *Globigerina* (*Orbulina*) *universa*. I am indebted to Mr. Parker for showing me precisely analogous cases in the growth of *Cymbalopora* and *Discorbina*; but in each of these genera it appears to be much rarer than in *Globigerina*.

I propose to make *Orbulina* a subgenus of *Globigerina*. The internal chambers are in form remarkably like those of *Globigerina*, and like them, also, they present themselves with varying surfaces, some free from, while others are covered with, spines. The form without internal chambers has been known under the name of *Orbulina universa*; I propose now to call it *Globigerina* (*Orbulina*) *universa*. The two forms containing the internal chambers may be regarded as subspecies, and appropriately designated *Globigerina* (*Orbulina*) *continens*, n. sp., and *Globigerina* (*Orbulina*) *acerosa*, n. sp., respectively,—the former being without, and the latter having, spines on some of its internal chambers. These spines, as well as those of *G. hirsuta*, are composed principally of carbonate of lime. I have found that they dissolve in weak acid; and under Mr. Parker's treatment with boiling potassa they were unaffected, which proves them to be not siliceous.

These spines on *G. hirsuta* have been looked upon as ossifications of the pseudopodia; but I find on examination that they do not take their rise from the centre of the honeycombed depressions of the surface in which the apertures are situated to admit of the extrusion of the sarcode, but are continuations of the material of the raised portions of the shell which surround the hollows. From their delicate nature, most of them get broken off in the nets; when unbroken, their ends are pointed, not very finely, but somewhat resembling the ends of *Belemnites mucronatus*. The texture and formation of these outer chambers in *Globigerina* (*Orbulina*) *universa* vary considerably—from a thin, fragile ball, to one in every respect equalling in thickness the chambers of *G. bulloides*.

The habits of *Globigerina* and *Pulvinulina*, I have proved to be identical, inasmuch as both frequent the surface of the ocean, to the possible exclusion of all other forms of the Foraminifera, and have the power of rising to and descending from the surface.

The one I find placed by Dr. Carpenter at the highest, and the other at the lowest, end of their respective subfamilies. I think

it desirable that they should be brought together and made into a separate and what appears to me to be a natural family, for which I propose the name of Colymbitæ*.

This family, then, will include two genera that, perhaps, ought never to have been separated, as their affinities are strongly marked, and their habits, and probably their structure, differ from those in the other forms of the Foraminifera.

Their having the power of rising to the surface surely shows that the animal must have some special means or organs adapted to this purpose; although they may not be distinguishable at present to our observation, the fact, I think, may be taken for granted. This family of the Foraminifera may then be considered to be the most nearly allied to the Polycystina, which, as I have before proved, are frequenters of the surface of mid-ocean.

Observation may yet show us the means used by both to enable them to rise and sink at pleasure. I may here mention that the *Acanthometræ* appear to have the same power and habits; and we may therefore infer that all these Rhizopods have some portion of their organization in common: I am not yet prepared to say whether or not all the recent known Polycystina may be found on the surface.

Dr. Wallich, in his work on the 'North Atlantic sea-bed,' does not appear to be able to prove quite satisfactorily that the *Globigerinæ* which he succeeded in getting from the bed of deep portions of the ocean were absolutely alive at the time taken; for he has the following passage at page 136:—"Under the most favourable circumstances and only after the lapse of considerable time do the shallow-water forms, when in captivity, exhibit pseudocyclosis or extend their pseudopodia; and hence, since it is in the last degree unlikely that those brought up from extreme depths should present these evidences of vitality, we must rest content with collateral proofs: fortunately these are of a very satisfactory kind." From this it will appear that the rising of these shells from the bottom after they have once fallen to it, is not yet satisfactorily proved.

That Dr. Wallich does not consider the *Globigerinæ* to be distributed through the waters of mid-ocean the following quotation from his work will show; and from it will be seen likewise that their shells are found as universally distributed at the bottom as I have proved them to be on the surface. "The minute calcareous shells of the Foraminifera are the most frequent and widely dis-

* From κολυμβητής, a diver.

tributed organizations of the ocean. They occur in all seas, in more or less abundance. But there is one genus (namely *Globigerina*) which may be regarded as essentially oceanic, since it is to be found in all latitudes, and at all depths, ranging from 50 to 3000 fathoms. Its seat of maximum development is on the deepest areas of the sea-bed. There, like the sands of the shore, it strews hundreds of square miles of surface, and apparently builds up vast strata. The great superficial current of the Atlantic does not bear it away in countless multitudes from tropical coast-lines, nor does the body of the ocean itself constitute its habitation."

To this there is the following note affixed at page 137:—"By sinking very fine gauze nets to considerable depths, I have repeatedly satisfied myself that *Globigerina* does not occur in the superficial strata of the ocean. On one occasion a small bag was drawn up through 700 fathoms of water in a locality where *Globigerina* abounded on the sea-bed, without entrapping a single shell."

To those whose minds are so constituted as to admit the conception of unlimited time for submarine deposits, the insignificance in size and quantity of this the Colymbitic family of the Foraminifera will be no obstacle to believing that the surface is their home; others, who wish for a larger and quicker supply to account for such deposits, must still look, with Dr. Wallich, for the abundance necessary to suit their views, to what may prove to be but their sepulchre.

I do not think with Dr. Wallich that it is absolutely necessary for these forms to sink to or to reside at any great depth for the purpose of recruiting their store of carbonate of lime, which is there supposed to be held in solution in greater quantities than at the surface, where, in mid-ocean, it is either altogether absent or very nearly so; while, on the same authority of Bischoff as quoted by Dr. Wallich at page 122, there are more than $3\frac{1}{2}$ of chloride of calcium in every 100 parts of soluble material contained in the salt water of the ocean, which in itself contains $3\frac{1}{2}$ per cent. of such soluble matter; and the supply of carbonic acid can be drawn from the atmosphere, either directly, or after its having been dissolved by the surface-water which they frequent. Such a little bit of chemistry, I take it, can be easily performed by organized beings.

At page 155 of the same work we find the following:—"The conditions prevailing at great depths render it impossible for

organisms still constituted to live under them to rise to the surface, or for the remains of these organisms after death to make their appearance in shallow water." If this important proposition at which Dr. Wallich arrived has been really established, then the rising of the *Globigerinæ* to the surface after having once subsided to the bottom, or to any considerable depth, is an impossibility. But on the other hand he says, in the same paragraph, "The conditions prevailing on the surface of the ocean render it possible for organisms to subside after death to the greatest depths, provided every portion of their structure is freely pervious to fluid." Now, as the Foraminifera are found living on the surface, if such laws prevail, they could never have been generated at, nor risen from, the bottom, but they might have been generated at or near the surface, and those found below might have subsided before or after death: we can hardly suppose that the two localities could produce precisely the same living organisms, if all communication from below upwards, in consequence of the existence of such a law, had been cut off between them. I therefore think it most probable that the Foraminifera found at the bottom were dead, or that they must have some means of again rising to the surface. To those who consider this impossible it must be left to get over the difficult ground interposed in the form of two or three miles of water, if they still consider that the bottom of the ocean is their natural habitat and the place at which they are bred.

I will now proceed to give the results furnished by my nets in the different localities over which I have worked.

The remarks made on each spot (for which the latitude and longitude are given) may be generally considered applicable to the whole space between it and the preceding one; for each portion was carefully gone over, day and night, in calm and storm, nets suited to the weather and rate of sailing having been used.

My observations in the Bay of Bengal must be taken as very incomplete. I was not on any occasion devoting my researches especially to the Foraminifera, but to other forms of life; and the state of my health on the last occasion when leaving India interfered with my work during the first part of the voyage.

The rest may be depended upon, with the exception of a few degrees near the Cape of Good Hope. After leaving lat. 37° S., and long. 26° E., I had no nets out for some three or four days.

At the head of the Bay of Bengal during the months of November and December, February and March, I found a few spe-

cimens of *Globigerina bulloides* of both forms, No. 1 and No. 2 as here represented (Plate V. figs. 6 & 7), also a very few of *Pulvinulina Menardii*. Running down the bay in long. 90° as far as 15° south, these forms continued to be met with, but in no great abundance.

In lat. 17° S., long. 80° E., I met with a very few of *G. bulloides* No. 2, and *G. inflata*.

From this point to lat. 22° S., long. 72° E., although the surface of the ocean was not altogether free from Foraminifera, *G. bulloides* No. 2 was but rarely found.

In 26° S. lat., and 55° E. long., the Foraminifera for the first time became at all plentiful. *G. bulloides* No. 2 was here very fine in size, and the most common form; *G. inflata* was here very large, but few in number; *G. bulloides* No. 3 and *G. (Orbulina) universa* were likewise present, and the individuals large.

About 250 miles south of Madagascar, in lat. 29° S., long. 46° E., *G. bulloides* No. 1 and *G. inflata* were still fine and plentiful.

In lat. 26° S., long. 51° E., the centre of this track, where Foraminifera abounded, not a trace of them could be found during the daytime.

At about lat. 29° S., long. 43° E., Foraminifera were very scarce.

In lat. 31° S., long. 31° E., very near the south-east coast of Africa, there were a very few of *G. bulloides* No. 2, and I met with but one specimen of *G. bulloides* No. 1.

Running along the coast to lat. 32° S., long. 30° E., none were taken in the nets.

In lat. 33° S., long. 29° E., a very few of *G. bulloides* No. 2 made their appearance, with one specimen of *G. bulloides* No. 1.

In lat. 37° S., long. 26° E., the Foraminifera were a little more plentiful, but still very few, and the individuals small: there were some of *G. bulloides* No. 1 and *G. bulloides* No. 2, and *G. inflata* was not entirely absent.

After passing the Cape of Good Hope, and before reaching lat. 33° S., long. 12° E., I found a great change; the Foraminifera had become very abundant, very much more so, even, than they had been to the south-east of Madagascar. *G. bulloides* Nos. 1 and 2 and *G. inflata* were equally common; but *Pulvinulina Micheliniana* here made its appearance, a very few small specimens of *Pulvinulina Menardii* were also present, and *Pulvinulina canariensis* likewise showed itself.

From this point to lat. 30° S., long. 9° E., the Foraminifera became still more abundant, and continued so to lat. 21°, long. 0°.

G. bulloides Nos. 2 and 3, *G. (Orbulina) universa*, and *G. inflata* were in abundance, with one or two specimens of *P. Menardii*. *P. canariensis* was moderately plentiful, *P. crassa* was present, and I here observed some three or four individuals of *G. (Orbulina) universa*.

In lat. 28° S., long. 7° E., the number of Foraminifera found on the surface had arrived at its maximum. *G. inflata* was the principal form; *G. bulloides* Nos. 1 and 2, *P. canariensis*, and *P. Micheliniana* plentiful; a few of *G. (Orbulina) universa*, and one or two of *P. Menardii* were also found.

In lat. 27° S., long. 5° E., *G. (Orbulina) universa* became more common, and many of them were less round in their form. *G. bulloides* No. 2 and *G. inflata* plentiful, but *G. bulloides* No. 1 not quite so abundant as before; a trace of *P. Micheliniana* still met with.

In lat. 25° S., long. 3° E., the net was towing from four in the afternoon till daylight next morning, and showed that but very few Foraminifera were on the surface; there were more of *G. bulloides* No. 2 than other forms; *G. inflata* was entirely absent. *P. Menardii* was here represented more fully than hitherto, and by one very large specimen. Although the Foraminifera were scarce here, other forms of animal life usually met with at the same time of day were abundant.

In lat. 23° S., long. 2° E., the Foraminifera were equally abundant. *P. Menardii* were fine and plentiful; *G. bulloides* Nos. 1 and 2, *P. Micheliniana*, and *P. canariensis* were all present, together with several of *G. (Orbulina) universa*.

In lat. 22° S., long. 1° E., *P. Menardii* is found very large, and appears to be the principal form present, it seeming to have supplanted many of the others, with the exception of *G. bulloides* No. 2. *G. bulloides* No. 1 shows two or three specimens also; there was one of *G. (Orbulina) universa*; *G. inflata* not quite absent.

In lat. 21° S., long. 1° W., *P. Menardii* and *G. bulloides* No. 2 continue plentiful as before; *G. (Orbulina) universa*, *P. Micheliniana*, and *G. inflata* but show their presence: at this point the abundance of the Foraminifera appeared to end. It was during the end of April that I sailed over this portion of the ocean.

In lat. 18° S., long. 2° W., very few Foraminifera were met with—some dozen individuals of *G. bulloides* No. 2, three of *P. Menardii*, and one of *G. (Orbulina) universa*.

In lat. 15° S., long. 5° W., the same scarcity remained: one

specimen of *G. bulloides* No. 1 was found, with a few of *G. bulloides* No. 2 and *G. (Orbulina) universa*.

In lat. 15° S., long. 6° W., the same scarcity; this continued at lat. 13° S., long. 8° W.

In lat. 12° S., long. 10° W., the number of Foraminifera very slightly increased to a few of *G. bulloides* No. 2, two *Orbulina*, and one *P. Menardii*.

In lat. 11° S., long. 10° W., a very slight increase took place.

In lat. 3° S., long. 18° W., the Foraminifera again became abundant—*G. bulloides* No. 2 and *P. Menardii* being equally fine and plentiful, with a trace of *G. (Orbulina) universa* and *G. inflata*: this was in the night of the 12th of May.

In lat. 2° S., long. 19° W., the Foraminifera had again nearly disappeared; still there were a few of *G. bulloides* No. 2, but more of *P. Menardii*.

In lat. 1° S., long. 21° W., but a trace remained of the same forms.

In lat. 0°, long. 22° W., *G. bulloides* No. 2 became more plentiful, with traces of *G. inflata*, *G. bulloides* No. 1, and *P. Menardii*.

In lat. 2° N., long. 23° W., there were about the same number of the Foraminifera as before, consisting of *G. bulloides* No. 2 and *P. Menardii*, but the latter was here the more abundant of the two forms.

In lat. 3° N., long. 24° W., the same observations may be applied to this part.

In lat. 6° N., long. 26° W., no Foraminifera on the surface.

In lat. 7° N., long. 26° W., a very few of *G. bulloides* No. 2, with traces of *G. bulloides* No. 1, and *G. inflata*.

A few miles to the north-west of the last spot, *G. bulloides* No. 2 and *G. inflata* suddenly became more plentiful, and amongst them I noticed two specimens of *P. Menardii* and one of *G. (Orbulina) universa*.

In lat. 9° N., long. 28° W., the Foraminifera were met with in great abundance: they consisted of *G. bulloides* No. 2 and *G. inflata*, together with a fair supply of *G. (Orbulina) universa* and a trace of *P. Menardii*.

In lat. 10° N., long. 29° W., the Foraminifera were in as great profusion as I have ever met with them. *G. bulloides* No. 1 and *G. inflata* were the principal forms; but *P. Menardii* and *G. (Orbulina) universa* were well represented, and of *G. bulloides* No. 1 there were many individuals.

In lat. 12° N., long 30° W., I believe the same profusion continued; but my nets were broken.

In lat. 14° N., long. 33° W., Foraminifera still continued in great abundance. *G. inflata* was the prevailing form; there were a few of *G. bulloides* No. 2 and *G. (Orbulina) universa*; I observed also traces of *G. bulloides* No. 1, *P. Micheliniana*, and *P. Menardii*.

In lat. 19° N., long. 36° W., the Foraminifera became rare. Of *Globigerina*, *G. bulloides* No. 2 and *G. inflata* were the only forms; but I observed one individual of *P. Micheliniana*.

In lat. 20° N., long. 38° W., no traces of Foraminifera.

In lat. 30° N., long. 43° W., scarcely a trace of Foraminifera. I met with but seven individuals of *G. bulloides* No. 2. From the last spot to this, we had passed some Gulf-weed, but it was in very small quantities.

In lat. 33° N., long. 44° W., slight traces of *G. bulloides* No. 1.

On Dr. Wallich's authority, I should consider that the Foraminifera are, at times and under certain conditions, plentiful on the surface of the ocean in more northern latitudes in the North Atlantic; for he has found them abundant at the sea-bottom: (I quote from page 137) "between the Faroe islands and Iceland, between Iceland and East Greenland, and for a considerable portion of the direct route between Cape Farewell and Rockall, *Globigerina* is the prevailing form in the deposits."

It will be observed that there were places in the Indian Ocean, and also in the North and South Atlantic, where I found the Foraminifera in great abundance—occasionally for one night only, but generally for many nights in succession, although during the daytime they were absent from the surface; they did not, then, after rising once and sinking, entirely disappear from the spot, but they would on the contrary reappear nightly over many hundreds of miles of water.

Their presence on the surface did not depend entirely on the weather; for in calm nights they have been found absent, or nearly so, while in fresh blowing weather the produce of the net showed that they were plentiful.

Further observations, if recorded as the above, will show us whether the presence of the Colymbitæ is confined to certain localities, or if they are to be met with in equal abundance at different times in all parts of the ocean.

In the above list of species met with, *G. (Orbulina) universa* must be understood to include both the other subspecies, viz.

acerosa and *continens*, as, without breaking the outer chamber of every shell, the difference could not often be determined.

Note.—From the latitudes and longitudes given above, the ship's course can be readily laid down on a map; and a more graphic representation will thus be obtained of the distribution of the minute ocean-fauna than can be conveyed in words.

DESCRIPTION OF PLATE V.

Fig. 1. *Globigerina* (*Orbulina*) *universa*.

2. *G. (Orbulina) acerosa*, n. sp.

3. *G. (Orbulina) continens*, n. sp.

4. *G. (Orbulina) continens* broken through the internal chambers.

5. *G. hirsuta*.

6. *G. bulloides*. Form No. 1.

7. *G. bulloides*. Form No. 2.

8. *G. bulloides*. Form No. 2: reverse side of Fig. 7.

9. *G. bulloides*. Form No. 3.

10, 11. *G. bulloides*. Other varieties.

12. *G. bulloides*. Reverse side of Fig. 11.

13. *G. inflata*. A sinistral shell.

14. *G. inflata*. A dextral shell.

15. *G. inflata*. Upper surface of a sinistral shell.

16. *Pulvinulina Menardii*.

17. *P. Micheliniana*.

18. *P. crassa*. A dextral shell.

19. *P. crassa*. A sinistral shell.

20, 21. *P. canariensis*.

On the Otolites of Fish, and their value as a test in verifying recent and fossil Species. By E. T. HIGGINS, Esq., M.R.C.S. &c. (Communicated by G. BUSK, Esq., Sec.L.S.)

[Read May 3, 1866.]

THE object of this paper is an attempt to show that the otolites of fish have a certain distinctive value in determining the genera and species to which they belong, and that the close study of them in the recent forms will enable the ichthyologist to confirm or disprove the specific relationship of recent individuals, and the geologist to determine the affinity of the fossil species. In making this attempt, it will be necessary to state my belief to what extent fish possess the faculty of hearing, and, in doing so, to indicate the

various modifications of the auditory apparatus of other members of the animal kingdom for comparison. The auditory organs consist of a contained fluid and of a solid body or bodies, with which the fibrillæ of the acoustic nerve are in close communication; but in order to render this simple form available for the recognition of delicate modulations, and give judgment of the distance and position of the vibration, a more complicated apparatus is given to the higher orders of the Vertebrata. We find in the Reptilia a drum or tympanum to receive the vibrations and transmit them, by means of an ossicle called the columella, to the internal ear; a canal bent upon itself also makes its appearance, which may be looked upon as a rudimentary cochlea. A similar, though slightly modified, arrangement exists in birds. In Mammalia, in whom the powers of hearing are more acute, and whose power of appreciating modulations is more sensitive, we have an acoustic instrument of the most perfect description, consisting of a chain of four ossicles, a well-developed cochlea, tympanum, and external ear. By many naturalists the circular arrangement of feathers surrounding the external opening of the ear in some birds has been looked on as the equivalent of the external ear in Mammalia; it must, however, be but an imperfect representative.

As, however, sonorous vibrations communicated to water pass through it with great intensity, it is absolutely necessary that a considerable modification of the auditory organs of its inhabitants should exist, or they would be perpetually liable to injury, or even death, from the violence of vibratory shock; we therefore find, as might be anticipated, a much simpler form of auditory apparatus in fish, deprived of external ear, tympanum, and cochlea, though it has been stated that a rudimentary cochlea does exist in some fish. This rudimentary form will at once suggest that fish derive their sense of hearing from other sensations than such as we term *sound*, and receive over the whole surface of the body vibrations which are conveyed to the internal ear. That a fish does not possess hearing in any other than a very simple degree is capable of proof; and we have frequent and direct evidence that they have no sense of either the direction or the immediate vicinity or distance of the source of the vibrations which disturb them. The experience of fishermen confirms this. A shoal of fish taking the bait freely will be disturbed, and sink at once to the bottom of the water, on the rounding of a point by a steamer, though at an immense distance, with as much alarm as if the danger threatening them were in the immediate neighbourhood. With-

out for an instant doubting that fish possess, in an exquisite degree, the sense of hearing, *i. e.* of receiving the vibrations conveyed through the water, I must differ in opinion from Pliny and all subsequent writers who speak of fish "coming when they are called," of their being "assembled by means of music or of a whistle," for one reason: "Sonorous vibrations taking place in the air are with difficulty communicated to the water, unless a membrane be interposed." And yet, in the above-cited cases no artificial tympanum having been interposed, we are called upon to believe that fish perceive and recognize the various modulations of sound taking place in the air. May we not rather explain their assembling at any one spot by the vibrations communicated through the earth to the water giving them notice of the approach of some person to the spot where they are accustomed to be fed? It is a fact well known to all observant anglers, that, provided they keep out of sight and remain still, all the talking, whistling, and shouting will not disturb the fish one hundredth part as much as one stamp of the foot or sight of the person.

There exists considerable modification in the form of the auditory apparatus in the various families of fish; and the passage from the "single tubiform labyrinth of the Myxine," through the "two semicircular canals and vestibule of the Lamprey," into the "three semicircular canals and vestibule of the higher cartilaginous and the whole of the osseous fishes is very simple.

The vestibule has been described as "dilating into one or more sacculi, separated from the *alveus communis* by a constriction or narrow canal." This description may apply to a few fish; but in by far the larger number no such separation exists. I shall therefore speak of the whole as the vestibule or vestibular sac, connected by one, two, three, or more tubular prolongations with the semicircular canals, the whole being filled with a thick mucilaginous or oleaginous fluid called endolymph, and surrounded by a thinner fluid, perilymph. "The semicircular canals are anterior, posterior, and external," and, though of large size, are considerably smaller than the passages traversed by them, and are suspended in them by a delicate network of fine threads of cellular membrane, no doubt for the purpose of softening the shocks received through the walls of the skull.

"In the higher Plagiostomata (Sharks and Rays) and in the Sturgeon, and also in the Lepidosiren, the whole are imbedded in the walls of the cranium," whilst in the osseous fish these internal parts of the auditory apparatus are lodged in a depression of the

skull on either side of the brain, to which Professor Owen has given the name of *otocrane*, and which is formed of the exoccipital, paroccipital, alisphenoid, mastoid, and postfrontal bones.

Occasionally the lower portion of the otocranes project below the true base of the skull, forming bony pouches, as may be seen in the *Hemiramphus* and some others.

The semicircular canals, as a general rule, are connected with one another in the following order:—The anterior with the posterior, and with the anterior termination of the external. The posterior, besides its union with the anterior, is joined to the posterior end of the external. At the points of union with the external, each canal terminates in an ampulla. In some cases the ampullæ are altogether wanting, and then each semicircular canal communicates with the vestibular sac by a separate tube; occasionally all the semicircular canals coalesce, and join the vestibular sac by one tubular prolongation. “The nerve supplying the ear-chamber and its contents arises between the fifth and the vagus,” occasionally receiving fibres from each, and is distributed to the semicircular canals, ampullæ, and vestibular sac, directly over the otolites, a few delicate fibrillæ passing inwards to be spread over the otolites.

The acoustic purpose of this arrangement is rendered obvious by an experiment performed by Camper:—

“He filled a bag with water, and placed within it a small globular body which of course, from its unattached freedom, was capable of rolling in any direction, according to the force of an external impulse.” “Sustaining the apparatus in one hand, he found that the slightest agitation given to the bladder was repeatedly felt by the reaction of the body within.” “The vibration, then, of the hard masses existing in the ears of fishes, probably augment the intensity of hearing, not so much by reverberating from wall to wall in the labyrinthine cavity, as by direct propagation along the filaments of the auditory nerve attached to the surface of the vibrating body.”

In a paper by Mr. Stoddart, “On the Organs of Hearing in the various classes of Animals,” published in the ‘Intellectual Observer,’ is a statement that the three otolites are connected by a ligament traversing the groove in the under surface of the largest otolite. This ligament I have not succeeded in tracing, and am inclined to question its existence, from the fact that the superior otolite sometimes occupies a different position on the two sides of the head, as may be seen in two preparations from the same

Wolf fish. On the one side it is situated just below the junction of the anterior and posterior semicircular canals, and on the other side below the junction of the anterior and external.

Professor Müller says that sound is conveyed to the auditory organs of fish by three media in succession, viz. :—

1st. The water in which the fish lives.

2ndly. The solid parts of the body and of the organs of hearing.

3rdly. The fluid of the labyrinth.

There can be no doubt that these are the principal media by which sound is conveyed to the organ of hearing; still to these ought to be added the air-bladder (where it exists); for though no doubt the principal use of this organ is to enable the fish, by the generation or expulsion of its enclosed air, to rise or sink; yet it must materially assist in multiplying by resonance and conducting the vibrations to the auditory nerve, thus supplying the place of a tympanum, especially to those fish, such as the Cyprinidæ and Siluridæ, where a direct communication exists between the anterior air-bladder (by its tubular prolongation) and the chain of ossicles communicating with the otocrane and its contained otoliths, semicircular canals, auditory nerve, &c.

This chain of ossicles has, by some comparative anatomists, been considered to be the representatives of the *ossicula auditûs* in other vertebrata. If they are recognized as such, we must deny to all fish, except those belonging to the highly favoured groups of Cyprinidæ and Siluridæ, possession of those organs of hearing. This subject, together with my reasons for questioning whether the opercular bones should, as believed by some, be considered the representatives of the *ossicula auditûs*, must form the subjects of future investigations.

Before passing on to the more immediate object of my paper, I would only add that I cannot understand the necessity of searching on the outside of the skull for these representatives, when we find the otocranes containing all the essentials.

The otoliths, or ear-stones, by analysis are determined to consist principally of carbonate and phosphate of lime and mucus, with a very small proportion of animal matter.

Mr. Stoddart says, "They are evidently formed by the crystallization of *carbonate of lime* in a gelatinous fluid, a condition well known to every chemist as interfering with the proper crystalline angles and planes by altering the regular arrangement of the calcareous particles."

And in a subsequent paper he states that "otoliths were de-

posited by a dialytic process, a thin section showing layer upon layer in strict accordance with such an origin."

Such is unquestionably the case with some of the Gadidæ, and may perchance be the character of the family; but in by far the largest number of fish the structure more nearly resembles that of bone.

The otolites amongst osseous fish may be said to be three in number on each side, as the exceptions to the rule are very rare. During the examination of more than 3700 fishes, I have only noticed five instances to the contrary. In three they were altogether wanting on one side, and normal on the other; these were in a Perch, Roach, and Salmon, fish possessing otolites sufficiently large to be readily found, if they existed. The fourth instance occurred in a Carp Bream (*Abramis brama*): the otolites on one side were quite normal in size, shape, and number; but on the other side *it* (for there was only one) was cartilaginous and abnormal. The fifth occurred in *Synaphobranchus Kaupii*, the anterior and posterior otolites being represented by numerous minute crystals imbedded in a tough membrane.

Though amongst my series of otolites a few examples of the three are exhibited, yet the only one of scientific interest is the central or largest, as the other two, which are usually placed superiorly and posteriorly, though occasionally lying on the central, or with it (as in the Cyprinidæ) forming a chain of bones, are in the majority of fish so small as to be with difficulty found, and, when found, of so little use for the purpose of scientific identification that I will almost pass over them, merely stating that the superior is usually more globose, smaller, and rather porcellanous, and varies considerably in form, being rounded, triangular, stellate, or hastate. The posterior otolite is usually semitransparent, somewhat resembling fish-bone in appearance, rounded, quadrate, semilunar, in one instance resembling the *stapes* wanting its base, and generally pectinated. Although many thousands of fossil otolites have been examined by me, no specimen that could be referred to either of the above has yet been met with.

The central or largest otolite is crystalline in structure, porcellanous, closely resembling beautifully pure enamel in appearance, very brittle, owing to the imperfect cohesion of its atoms, easily rubbing down into almost impalpable powder. In spirit the porcellanous appearance is after a time destroyed, and the otolites become, to a certain extent, chalky and opaque. This otolite is concave above, convex and grooved below, indented or

denticulated at the margins, as a general rule wider anteriorly than posteriorly, though sometimes just the reverse—usually longer than broad, ovate, quadrate, pyriform, tapering at both ends, furcate at both ends, or furcate at one end and rounded at the other. In fact, to give anything like an idea of their protean forms, a description of almost every species would be necessary.

In the Sturionidæ, or Sturgeons, which are always arranged between the cartilaginous and osseous fish, the otolites, as might be expected, are of an intermediate type and distinct form, consisting of slightly adherent crystalline granules, imbedded in a dense cartilaginous membrane.

In the true cartilaginous fish the otolites are soft, shapeless masses, closely resembling wet chalk. Under a microscope they are seen to be composed of almost perfect rhombic crystals.

A good deal of stress has been laid on the shape of the "groove on the under surface of the central otolite, as absolutely necessary for the identification of a species." I am quite ready to admit that there is a very great difference in its shape amongst genera; but in closely allied species it is so similar as to be almost identical, and therefore, *per se*, not to be depended upon. So far as my experience goes, identity of outline is the only certain character: and fortunate it is that such is the case; for in by far the largest number of fossil otolites the convex under surface is more or less bouldered and consequently the shape of the groove altered, so that, were this essential for identification, but few species could be recognized. The concavity of the upper surface being better preserved, the task is rendered comparatively easy, and but little skill is necessary in dividing them into species. Without attempting to give a rigorous definition of what ought to constitute a species, I may remark in general terms that wherever I find fishes differing from each other to that degree and in those external characters which are usually accepted by naturalists as entitling them to rank as a distinct species, there I find each of these species having a distinct otolite, and with the distinction sufficiently well marked to enable me to refer each otolite, when detached, to the species of fish from which it has been taken—after having, of course, once seen it *in situ*. Now this is, perhaps, more than can be said of either teeth or scales, and certainly than can be stated of any other isolated portion of the skeleton or hard parts in fishes; and it is a generalization of the highest interest in connexion with palæontological researches, as these otolites are often met with in

tertiary formations when no other vestige of the fish to which they belonged has been preserved, all the other remains consisting of teeth and vertebræ of cartilaginous fish. It may be as well to state that, so far as my examinations of British fish have gone, every species, recognized as such by Mr. Couch, has its distinction borne out by the otoliths.

Much diversity of opinion exists as to whether the otoliths are to be looked upon as the "analogues" or "homologues" of the *ossicula auditûs*; but it appears to me that their position in the vestibular sac and semicircular canals proves that they are only excessive development of the otocones, and not representatives of the true ear-bones,—an opinion in which I believe most anatomists will concur.

In a short notice published some years since, I stated that the specific characters of the otoliths were more to be depended upon than the generic. Further investigations induce me to considerably modify this assertion; and although every species may be recognized by its own peculiar central otolite, I am inclined to believe that it is possible to group the species of each genus as having some character in common.

Fossil otoliths have long been known to all collectors of tertiary fossils, but no classification of them has yet been made. The first attempt was that of Mr. Charlesworth, nearly thirty years since, and engravings were made of some of the principal forms; but I believe nothing further has been done with them. The formations which have yielded them in the greatest abundance are the Crag (Coralline Crag), the Hordwell Highcliff, Bracklesham, Brook, and Bramshaw tertiary-beds, and the Gault of Folkestone.

All the otoliths from the Coralline Crag, that I have yet had an opportunity of examining, belong, without a single exception, to existing species of Gadoids, viz. Cod, Whiting, Pollack, Whiting Pout, Green Cod, &c.; there is therefore every reason for believing that the portion of a skeleton of a fish from the Coralline Crag, described in the 'Geologist,' and with some hesitation referred to this family, was undoubtedly Gadoid.

Sufficient has been said, I think, to prove that, to the Palæontologist, the careful examination of these small bodies will be of great assistance in enabling him to trace to a comparatively remote era the first appearance of many of the existing species of fish.

To the student of recent ichthyology they will be found of equal value, enabling him to discriminate between closely allied forms. I speak with tolerable confidence of their specific value, having

examined more than 3700 fish, representing nearly 450 species, and never yet, save in the instance of the Carp Bream, found any abnormal form which could create a difficulty in identifying a species if ever seen before. In some closely allied species I must admit that the distinctive marks are very slight, but sufficiently characteristic to make their separation and identification a matter of no great difficulty.

1. In the Percidæ. The central otolite is more or less oblong (as in *Perca*, *Labrax*, and *Polyprion*); oval, posteriorly acuminate (as in *Acerina*, *Trachinus*, &c.).

2. In the Gurnards. Almost circular, with a slight furcation, margins indented.

In *Cotti*. Long and narrow, tapering at each end.

In *Gasterosteii*. Smooth and rounded.

3. In the Sparidæ. Very concavo-convex, margins, especially the inner, deeply indented, tapering considerably at either end.

4. In the Scombridæ. Furcate (as in *Scomber* and *Caranx*); stellate (as in *Zeus*); irregularly pisiform (as in *Capros*).

5. In the Tænidæ. Elongated (as in *Sepola*); very deeply concave, the inner and outer margins bent inwards (as in *Trichiurus*).

6. In the Mugilidæ. Very concave, margins indented; width nearly equal.

7. In the Gobioidæ. Furcate (as in the Blennies and *Anarrhichas*); globular (as in the Gobies); elongated (as in *Callionymus*).

8. In the Lophiidæ. Outer margin semilunar, inner denticulated.

9. In the Cyprinidæ. Subglobular, cuneate posteriorly, the degree of cuneation being specific.

10. In the Esocidæ. Furcate, inner margin denticulated (as in *Esox*); elongate and oval (as in *Belone*, *Hemiramphus*, &c.).

11. In the Siluridæ. Subglobular and mammillated (as in *Callichthys*); pisiform (as in *Silurus*).

12. In the Salmonidæ. Rather triangular, anteriorly acuminate (as in *Salmo*); posteriorly furcate, denticulated below, and slightly acuminate anteriorly (as in *Coregonus*).

13. In the Clupeidæ. Posteriorly furcate and truncate, anteriorly rounded and indented.

14. In the Gadidæ. Thick, mammillated; pyriform, or elongate oviform (as in *Morrhua*); elongated and tapering (as in *Motella*).

15. In the Pleuronectidæ. Nearly flat, oval, rounded, quadrate or truncate.

16. In the Echeineidæ. Oval and furcate, deeply grooved.
17. In the Murænidæ. Oval (as in *Conger* and *Anguilla*); globular (as in *Leptocephalus*).
18. In the Anguillidæ. Elongate (as in *Ammodytes*).
19. In the Syngnathidæ. Globular.
20. In the Gymnodontidæ. Globular and very irregular (as in *Tetrodon*).
21. In the Sclerodermi. Irregular, posteriorly acuminate (as in *Balistes*).

Stray Notes on some of the smaller Crustaceans. Note II. On the Habits, &c. of the *Hyperiidæ*. By THOMAS EDWARD, A.L.S.

[Read December 6, 1866.]

As intimated in my last, I would now speak more fully of the other three species alluded to, viz. *H. oblivia*, *medusarum*, and *minuta*.

Although I have, as already stated, occasionally taken both the others from the *Medusa*, I have never as yet met with, nor seen, even so much as a single specimen of either of these attached to anything. And of the first (*H. oblivia*) which seems to me to be the most abundant of the whole tribe, at least in this quarter, I have seen thousands, nay, millions, or countless hordes. So numerous are they occasionally, that I have seen the water to a certain extent darkened by them; and this was the case when not a single *Rhizostoma* was within view, or perhaps on the coast. And instead of the *Hyperia* assailing the fish, the latter would seem to have become the aggressors; for the stomachs of many of those that were caught about the periods referred to were generally well stored with these Crustaceans.

On one occasion, and in winter, immense shoals of the common Herring (*Clupea harengus*) chanced to visit us—a rather rare case; and great numbers were taken. About two dozen of these came into my household, and, as is my usual practice with all kinds of fresh fish, I of course looked into their stomachs to see what could be got there. On doing this I was rather surprised to find them all full of this Amphipod, as I had never before found them in the herring. This caused more to be procured, which were caught the day after, and I found their stomachs full also. From one I took 59, from another 47, and from a third 33; and all the others were more or less well crammed.

These statements are not on hearsay. They refer to undeniable facts which came under my own personal observation.

Now, if all the herrings composing these shoals had been as well supplied as those I dissected (and we cannot tell that they were not), how amazing must have been the number of this Crustacean! It is likewise worthy of remark that these herrings were taken at from four to five miles from land, or perhaps more.

Again, I have also seen them cast on shore during gales from the north (Banff lies on the south side of the Moray Firth) in most enormous and incalculable numbers. On one occasion, and for some distance, our rock-pools were filled with literally one living mass of them. But if I was astonished at this, what was my surprise, on reaching the sands which run continuous with the rocks alluded to, at beholding a ridge or wall of these animals extending more than a hundred feet in length, and varying from 1 to 2 inches in height and breadth, which had been washed up by the sea! And, instead of lessening, each succeeding wave only added thousands upon thousands to the general wreck. On another occasion a still larger portion of the sands were again strewn in a similar manner; but there were none then in the rock-pools. They would appear to come inshore in great bodies at times, in search of food perhaps; and should a storm arise, they are then of course unable to work their way out, and are in consequence inevitably overwhelmed in ruin by being tossed on land.

From these facts, something like at least a vague idea may be formed as to the prodigious numbers of this species. But it is only those who have been blessed with a sight of the vast legions which occasionally appear who can form anything like a true estimate of the fact.

I cannot, however, say so much for, nor of, the other two species. Whatever they may be elsewhere, they are the scarcest of the genus here. I have only taken *H. medusarum* on three or four occasions, and but a few each time.

This species is decidedly the gem of the whole. It is partially pellucid, being beautifully banded, alternately, with rings of a crystal hue and others of a deep red.

As regards *H. minuta*, I have only taken it twice, and even in fewer numbers than the last.

Having kept these alive also, I am enabled in some measure to say that in their general manners all three resemble each other, their restlessness and activity being one of their most remarkable traits, and beyond the power of description. But if I were to particularize any of them as being more lively and more restless than the rest, I certainly should give *H. minuta* the character, as

being the most active species which, so far as I remember, I have as yet seen. All three seem to me far more active in their whole movements than either of their congeners, *L. Kinahani* or *H. galba*, and they do much better in confinement.

It strikes me very forcibly that these are what some would call carnivorous in their diet; at least I am pretty sure that *H. oblivia* is, and am inclined to think that the others are so likewise, from the fact that their habits are so alike in every other respect.

On one occasion I put a few individuals of *Hyperia oblivia* beside some shrimps (*Crangon*, *Mysis*, &c.). On looking again some time after, I saw one of the *Hyperia* on the back of a *Mysis*. I also observed the latter give some strange jerks with its tail, but took no further notice of the circumstance, not dreading anything serious. The shrimp was swimming at the time with the burden on its shoulder. This was in the evening. Next morning I found both at the bottom, still together, but the shrimp dead. This drew my attention more closely to the case, and I endeavoured to drive the *Hyperia* away; but, although I twirled him with a camels'-hair brush for several minutes, I failed in my object; and it was not until I had the *Mysis* at the top of the water that he condescended to let go. I then examined the shrimp, and found an incision at the extreme end of the carapace, and just where the soft part of the body commences, and so deep that the animal broke in two on being again lifted. I am not saying from this, however—at least I do not affirm it as a truth, that the *Hyperia* killed the shrimp; but I believe he did, and, by way of making food, had scooped out the part alluded to. I have lost shrimps in this way before, without very well knowing why. I likewise find various of the softer species when cast on shore treated in the same fashion when the *Hyperia*, and especially *H. oblivia*, are on the coast. They appear well enough until you attempt to take them up, when they in most cases break either into two or three pieces. Fragments, too, are often thrown up. I know that *Eurydice pulchra*, the little tyrant of the shore, is a great enemy to the shrimp, and many others of his kind, but I am much mistaken if some of the *Hyperia* are not something similar.

It would seem that not a few of our Crustaceans, like several species of birds and fish, &c., are to some extent migratory; and perhaps to no portion does the term apply so much as to those now under consideration. Although they may not exactly observe the same regularity and order as some other of our migrants do, still I am certain that they do make periodical, or in some cases

it may be but casual visits, at least to this part of the kingdom. I have never yet missed *H. oblivia* a single season since I began to look to these things, and was able to go out. The same may almost be said of *L. Kinahani* and *H. galba*. But although I have not met with these so invariably, nor even with *H. medusarum* and *minuta*, still that is no proof that they are not as regular, or nearly so, in their visits as *H. oblivia*, though fewer in numbers. It is hardly possible, in fact it is impossible, that one individual could see all that happened every year, even in this small way and though but in a single district; still I think I am not far from the mark. It will be as well, however, in the meantime, perhaps, to look upon *H. medusarum* and *H. minuta*, but especially the latter, as but casual or accidental visitors only. And it is, I believe, during these peregrinations that on coming too near the land so many of them, as in the case of *H. oblivia*, are occasionally washed in and destroyed.

Lestrigonus Kinahani and *Hyperia galba* generally appear here about the beginning of July, and disappear again towards the end of September; *H. oblivia* usually about August, and continues till spring; *H. medusarum* in December, and remains till March (on one occasion I took two of this species as late as the month of May); and the time I found *H. minuta* was from October to December. During these periods, too, I have never failed to find the females of all, save the first, to contain, in some cases eggs, in others well-developed young. With reference to *H. oblivia*, I not unfrequently find females of this species with young from September to January, thus extending over a period of five months.

Although I have taken *H. oblivia* from the stomachs of different species of fish besides the herring, I have never yet found any of the other in a heterogeneous repository of the kind.

There is yet another circumstance which I would here mention, as being, in some measure, in connexion with my subject. Of itself, however, it may be of little or no value, but when taken in conjunction with the others will, I trust, be at least found worthy of record. It is that, during some seasons when the *Medusæ* were very plentiful, I have noticed that the *Hyperia* (I here allude only to *L. Kinahani* and *H. galba*) would be remarkably few, and *vice versâ*. And during no season, within my recollection, has this been so much and so strikingly the case as in the present (1866), the *Medusæ* having been far more numerous here than ever they were known before. Now, and from this circumstance,

there are many, no doubt, who would have expected that at least a portion of the *Hyperiidæ* would be equally abundant.

But what was really the case? Why, scarcely any *Hypericæ* at all—that is, so far as I have observed. True, I have not been able, from ill health, to look after the matter so much, nor give it the attention, this summer, that I should have liked; still I have been out; and had they been there, I do not think they could have escaped my notice.

It chanced that one day in July, and two in August, great hordes of the *Medusæ* were cast in upon our beach; and out of many hundreds of these, which I had the satisfaction of examining, and that carefully too, I only got seven *Hypericæ*—one *L. Kinahani*, and six *H. galbæ*. The first was adult, but none of the others. Two, on these occasions, were the most found in a single *Medusa*. Thus these seven, and about thirty others which I obtained free, are all my season's take—that is, of these two species—making in all about two score. Yes, only two score, and that, too, when, as I have already stated, the *Medusæ* were in such prodigious shoals that they were never known to be so numerous in this part of the sea before.

On the other hand, I have met with *L. Kinahani* and *H. galba* very plentiful whilst not a *Medusa* was to be seen and there was perhaps not one in this part of the Firth.

Such, then, are a few and rather briefly told facts concerning these curious and interesting creatures—a genus whose true habits and economy seem, as yet, to be but little understood. And if I have been able to add to their general character even but one single fact not hitherto known, I shall consider myself well rewarded for my time and labour—a labour which is to me at all times a pleasant occupation.

Experimental Investigations with Cestoid Entozoa. By T. S. COBBOLD, M.D., F.R.S., F.L.S., Lecturer on Comparative Anatomy at the Middlesex Hospital.

[Read Nov. 1, 1866.]

Having from time to time in conjunction with Professor Simonds carried on a series of experiments which (so far, at least, as I was concerned) were originally promoted by a small grant of money placed at my disposal by the General Committee of the British Association, the present record may, in some sense, be regarded as a continuation of our joint Paper communi-

cated to the Royal Society *. During the past year, however, the incessant demands on Mr. Simonds's time (occasioned by the rinderpest epidemic) have left him so little leisure that he has desired me to make use, in any way which I might think fit, of the results thus unitedly obtained. I may remark that the procuring and selecting of our experimental materials (such as trichinous flesh and tapeworm-proglottides) generally devolved upon myself, whilst, on the other hand, the actual administrations were made either by Mr. Simonds or by Mr. Pritchard, the Assistant Professor and Anatomical Demonstrator at the Royal Veterinary College. On these occasions other persons, as well as myself, sometimes rendered aid. I may likewise add that I do not here record certain experiments which Mr. Simonds conducted independently, but only those for which I may rightly be considered exclusively responsible.

Tænia mediocanellata.—Exp. 1. This successful case, in which about 8000 tapeworm-larvæ were reared in a calf, is already fully reported in the Proceedings of the Royal Society for May 4, 1865, No. 75, vol. xiv. p. 214.

Exp. 2. Four separate worm-feedings were administered to a calf, namely 50 sexually mature proglottides of *T. mediocanellata* on the 13th of April (1865), 160 proglottides on May 16th, 120 proglottides on June 1st, and a final hundred on the 17th of the last-named month. Mr. Simonds states that this animal gave no evidence of helminthic symptoms. On the 2nd of September it was attacked with rinderpest, and died in 36 hours. I had not myself an opportunity of examining its flesh, and Mr. Simonds failed to detect any cysticerci in the muscles.

Exp. 3. In this case the experimental animal was a fine healthy Dutch heifer, about two years old. On the 3rd of March she swallowed 90 proglottides given in tepid water. On the 15th of the same month 108 proglottides were also administered. On the 5th of April another 100 joints were given; and for a few days after she seemed rather restless, bellowing occasionally. No other symptoms having followed, on the 13th of the succeeding April I made a very careful selection of 200 ripe proglottides, from specimens which I had that day received from Birmingham, through the kindness of Dr. Fleming. For some some days the restlessness appeared to increase slightly, and the bellowing continued. In addition there were certain peculiarities of manner

* "On the Production of the so-called 'Acute Cestode Tuberculosis' by the administration of the Proglottides of *Tænia mediocanellata*."

which convinced Mr. Simonds (who watched the animal almost daily) that we had here, at least, a feeble development of those symptoms of the "acute cestode tuberculosis" which were so strongly marked in our first experiment on a calf. There was the same vacant stare, a dull expression of the eye, slight arching of the back, and stretching of the limbs. However, the heifer never lost her appetite, and, strange to say, whilst all the cattle near her were attacked by (and most of them died of) the rinderpest, she entirely resisted its invasion. In about a week all the measles-symptoms passed off, and in course of time the animal attained the proportions and aspect of a large, healthy, three-year-old cow. It was not until the expiration of rather more than a year from the time of our first feedings, namely on the 4th of April 1866, that the beast was slaughtered. With Mr. Pritchard's assistance I made a very careful dissection and examination of the beef thus obtained; nor was it until I had subjected the muscles for many minutes to a very close and careful scrutiny (with the aid of a pocket-lens) that I succeeded in detecting evidence of the successful character of our experiment. The result was most interesting, especially since none of the previously recorded experiments (either by ourselves or those previously instituted by Leuckart and Mosler) had extended over such a period of time. Here the only indication of the presence of measles was shown by the existence of extremely minute calcareous specks, larger, it is true, but by no means so conspicuous as ordinary *Trichinacapsules*. They presented the aspect of sparsely scattered yellowish points without any definite outline or any other character likely to catch the eye. It is even difficult to see them in sections of the flesh which I have expressly preserved to show them. Microscopic examination affords evidence of the remains of a small cyst; but all trace of the measles itself is entirely lost. Each cysticercus had become, as it were, resolved into a more or less amorphous, solid, friable, crystalline particle, whose true characters (as presented to the naked eye) were obscured by a closely investing and remarkably contracted cyst, the external surface of the latter becoming insensibly blended with the ordinary intermuscular connective tissue. By a little care, however, the calcareous particles could be perfectly isolated from their cysts. They were numerous and, owing to the deeper colour of the muscular substance, most easily found in the diaphragm. In other muscles they were, perhaps, equally abundant, but it was a great labour to find them. Assuming them to have been pretty equably

distributed throughout the muscular system, there could not have been less than 12,000 of these degenerated measles in the animal. I have no hesitation in saying that, if there had been 12,000,000 of these measles, no butcher would ever have noticed them; but, fortunately, in this condition their ingestion could do no possible harm. In point of fact, the flesh of the animal has since been entirely eaten; and healthier beef I never saw. Even in their perfect, non-degenerated state, the beef measles are readily overlooked; and until recently no person besides Mr. Simonds, Mr. Pritchard, and myself, and those who assisted us, had even seen them in this country. The experiment now recorded is the first in which the natural process of cure has been traced; and it is of great practical importance, inasmuch as it proves to demonstration that a period of ten or twelve months is fully sufficient to ensure the natural death (by calcareous degeneration) of the smaller tapeworm-larvæ which reside in cattle. This is a positive contribution to our knowledge of the life-economy of these smaller cysticerci, and it serves to fix the period of their larval activity. All the entozoa, in their juvenile stages, whilst occupying the flesh of man and animals are liable to be affected by this law of calcareous degeneration; but the actual time required to bring about the death of the parasite varies considerably in different species.

Tenia serrata.—Exp. 1. Three examples of the pea-shaped hydatid (*Cysticercus pisiformis*) were removed from the abdominal viscera of a recently killed rabbit. Two of them were rather more perfectly developed and larger than the third. The rabbit harboured no others. These three cestode larvæ were administered, on the 25th of January 1865, to a healthy puppy, reared at the Veterinary College and nearly twelve weeks old. Five days subsequently, namely on the 30th of the same month, the puppy was destroyed. In the alimentary canal I found three young *Tenias*, and three only. Two of them were severally about 1 inch in length, the third being a trifle shorter and not quite so large. These sexually immature tapeworms presented all the true characteristics of *T. serrata*, and their degree of development was in exact accordance with my previous experiences in this relation. The more feeble development of the third tapeworm proved its genetic connexion with that larva which at the time of the worm-administration was noticed and recorded as being rather incompletely developed. The experiment was a perfect success.

Exp. 2. On the 25th of January, 1865, a second rabbit was destroyed, for the purpose of procuring additional tapeworm-larvæ.

In this rabbit I only found one solitary and perfect *Cysticercus pisiformis*—a somewhat unusual circumstance. Mr. Simonds placed this larva in a small piece of paper, and in the form of a bolus gave it to a little puppy which belonged to the same litter as the former, being readily distinguished by its black ears. We did not destroy this whelp until the 7th of the following February, thus allowing a period of thirteen days to elapse for the development of the solitary *Tænia serrata* which we desired to rear from the cysticercus. Mr. Simonds, as usual, requested me to examine the alimentary canal; and I had the satisfaction of removing the solitary *Tænia serrata* we had thus successfully reared. It was just 6 inches in length, showing the same correspondency as to growth, in respect of time, which my previous and independent experiences with the artificial method of rearing this parasite had invariably supplied. The proglottides were still immature, but the cephalic development was in all respects complete.

Tænia marginata.—On the 28th of January, 1865, Mr. Simonds removed fourteen specimens of the so-called slender-necked hydatid from the omentum and surrounding viscera of a hogget. Five of these large cysticerci (*C. tenuicollis*) were administered to the mother of the two whelps above referred to. They were swallowed entire, without any additional material. This dog was killed on the 7th of the following February, thus allowing only ten days for the development of the corresponding adult tapeworms. As usually happens in all old dogs, we found in the intestinal passages many examples of the extremely common cucumerine tapeworm (*T. cucumerina*); but these of course could have no genetic relation to the tapeworm-larvæ, which latter were already known to be the offspring of an entirely different species of cestode parasite. Our experiment, indeed, was a perfect success; for, in addition to the cucumerine tapeworms (of which there were fifteen mature specimens of variable size and growth), I found in the duodenal portion of the intestinal canal five young and sexually immature examples of the *Tænia marginata*. These were of uniform size and severally 1 inch in length. Not a shadow of doubt could be entertained as to their relation to the five cysticerci which had been administered. Their specific characteristics, uniform development, degree of growth, and separate location in the canal, pointed unequivocally to the source whence they had been derived. Here again, therefore, previous experiences received abundant confirmation.

Tænia cænurus.—Exp. 1. On the 15th of March, 1865, Mr.

Simonds received (from Messrs. Caudwell, of St. Neots) the head of a "giddy" sheep which had been killed two days previously. On examination the brain was found to contain a perfect polycephalous hydatid (*Cœnurus cerebralis*) which, it was estimated, supported about 150 scoleciform processes, or larval tapeworm-heads. It was removed entire, and given by Mr. Simonds to a dog, which swallowed the parasite readily in its unbroken condition. Only five days subsequently, namely on the 20th of March, the experimental animal was destroyed; and here again a complete success attended our experiment. A careful examination of the alimentary mucus enabled me to extract a large number of extremely minute tapeworms, of so small a size that they were scarcely visible to the naked eye. Though only the heads and necks were developed, their characters corresponded with what was hitherto known of the head and neck of *Tænia cœnurus*, to which species they were undoubtedly referable. Their number appeared to correspond precisely with the number of scoleces attached to the common "gid" vesicle; but no attempt was made to collect every specimen, as that would have involved an immense amount of unnecessary labour. All trace of the vesicle common to the colony of "heads" had disappeared, the necks of the scoleces, detached by digestive action, having become rounded off and more or less pointed (according to the degree of contraction shown by each specimen while under microscopic examination).

Exp. 2. On the 6th of April, 1865, a similar administration, with a brain-hydatid furnished with about 100 cephalic processes, was performed on a stray dog. Two days subsequently, however, the animal was claimed by its rightful owner, and we had therefore, in this instance, no opportunity of ascertaining the result of our experiment.

Exp. 3. On the 25th of April Mr. Simonds received (from Mr. Mackinder, of Peterborough) the head of a sheep affected with "gid." The brain was found to contain three *T. cœnuri*. One of these, furnished with numerous heads, was given to a large half-bred lurcher dog. On the 16th of the following May the animal was destroyed, thus permitting twenty-one days for the development of the slow-growing *Tænia cœnurus*. As too often happens in the case of old dogs, the digestive passages were found loaded with a great variety of tapeworms; nevertheless it was here again quite easy for us to distinguish between the parasites which had been introduced by our experiment and those which had gained access to the canine "bearer" without our aid. Thus

there were found in this "Lurcher" several examples of the large *Tænia marginata*, six or eight specimens of *Tænia serrata*, and a few examples also of *T. cucumerina*. There were likewise some half-dozen nematodes (*Strongyli*). In addition to all these, however, there were a multitude of small tapeworms (of the species *T. cœnurus*), the longest of which did not exceed one inch and a half in length, sexually immature, and manifestly corresponding with the numerous scoleces artificially introduced. Again, therefore, despite the inconveniences always liable to attend administrations of this kind on old dogs, we had abundant proof of the success of our experiment.

Exp. 4. On the 25th of April, 1865, another of the two remaining *T. cœnuri* just mentioned was given by Mr. Simonds to a smaller dog. This hydatid was also well furnished with cephalic processes (or larval tapeworm-heads). In this case the experimental animal was not killed until more than two months had elapsed from the time of the worm-administration. On the 29th of the following June we made the necessary examination. Again we were successful. The intestinal canal contained large numbers of the *Tænia cœnurus*, there being no other kinds of entozoa present. The experiment was therefore even more satisfactory than the previous one. The largest specimens measured about 18 inches in length; but when I examined their proglottides, the contained eggs were still not quite perfectly developed. The primitive yelk-sacs and superfluous granular yelk masses were very conspicuous, but the true chorionic envelope was only in the act of forming. The swallowing of the ova in this imperfect stage would lead to no result. Probably another week or ten days would have sufficed to render all these *Tæniæ* sexually mature.

Exp. 5. On the 8th of July, 1865, a large *T. cœnurus* was given to a terrier, which was also subsequently fed with trichinous flesh. This animal died on the 2nd of August of the present year, but unfortunately neither Mr. Simonds nor myself had any opportunity of examining the contents of its viscera. A portion of its muscle-flesh was sent to me for microscopic examination, and this I found to contain encysted *Trichinæ*.

Tænia echinococcus.—On the 23rd of June, 1865, I sent several fresh *echinococcus*-hydatids to the College, which were on the same day administered to a dog by Professor Simonds. By an oversight this animal was not destroyed until the 18th of August, 1866, when, as regards the *Tænia echinococcus*, we obtained only a

negative result. This dog was likewise the subject of a *Trichina*-experiment in which we were entirely successful. It also harboured eleven specimens of *Ascaris marginata*, and many examples of *Tenia cucumerina*; these, of course, were introduced by natural causes.

Tenia solium.—The only two cestodes which I have hitherto not succeeded in rearing are the present and foregoing species. My non-success in the former case I can very readily explain—not so in the latter. Negative results, however, oftentimes prove highly instructive; and it is, even here, just possible that I may have hit upon the true explanation of my non-success in the case of *Tenia solium*. At all events it is but fair to place the facts on record.

Exp. 1. On the 30th of January, 1865, and on the 23rd of the following February, numerous tapeworm-proglottides were given to a pig, which afterwards displayed no measles-symptoms. It was destroyed on May 16th, 1865, and on examination yielded no cysticerci. Most, if not all of the “joints” first given, I subsequently ascertained to be those of *Tenia mediocanellata*, whilst those of the second feeding were from what I had previously described at the time as a “very small variety of *Tenia solium*.” I now believe the latter to have represented neither *T. solium* nor *T. mediocanellata*, but an altogether distinct and new-form cestode. If this conjecture turn out correct, the explanation of this non-success is sufficiently obvious.

Exp. 2. On the 30th of January, 1865, some of the same experimental material was given by Mr. Simonds and myself to another pig. On the 15th of March following, seventy proglottides of a *T. solium* (which I fear had been placed in spirit before transmission to me) were also administered, and again, on the 13th of April, not less than 200 proglottides of my so-called small variety of *T. solium* were likewise introduced. In this case the small “joints” were transmitted to me by Dr. Alexander Fleming, of Birmingham, along with other parasites, to which I have elsewhere referred. The pig was killed on the 30th of May, 1865, and the result was again negative. The explanation of our non-success is similar to that I have assumed to hold good in the previous case. The March feeding, certainly, might have yielded *Cysticercus cellulosæ*, but I never could ascertain who sent me the parasite, and I had not a little reason for believing that the parasite had been immersed in alcohol. My previous experiences had shown that even a comparatively weak spirit-solution effectually

destroys the vitality of the ova and their contained six-hooked embryos.

Exp. 3. On the 30th of May, 1865, thirty proglottides, and on the 17th of the following June, fifty more (the parasite, in each case, being subsequently ascertained to belong to the species called *Tenia mediocanellata*) were given to a young pig. Again, on the 22nd of June, same year, I had the satisfaction of procuring (through the kindness of Dr. M'Kendrick, Physician to the Leman-street Dispensary, London) sixty perfect, fresh, and fully mature segments of an undoubted example of *Tenia solium*. These were administered to the pig by Mr. Simonds without any delay. In this case, therefore, I had every reason to anticipate a successful result. The animal was not killed, however, until the 4th of April, 1866 (the same day as that on which the heifer was slaughtered), when no traces of any measles were detected. If, as I think quite possible, measles had developed themselves and subsequently undergone calcareous degeneration, the pale colour of the pig's flesh may have prevented my detecting them. But for the dark colour of the muscular tissue, in the case of the heifer, I certainly never should have detected the degenerated beef-tapeworm-larvæ. At all events this is the only explanation I can offer. The experiment, as regards its results, had certainly been allowed to stand over too long.

In conclusion, it may be remarked that, notwithstanding this want of success in respect of the two last-named species, we have every reason to be satisfied with the results obtained in the cases of *Tenia mediocanellata*, *T. serrata*, *T. marginata*, and *T. cœnurus*.

In addition to the above-recorded experiments with *T. mediocanellata*, it may be mentioned that we gave a sheep a single "feeding," consisting of forty proglottides of this tapeworm; but from the negative experiences previously obtained by Leuckart in this relation, I felt sure that we could only get a similar result. The recent discovery of measles (furnished with hooks) in mutton by Mr. Charles Heisch, F.C.S., and also, independently, by myself, has inclined me to look for a third and distinct species of tapeworm as the progenitor of the armed mutton-measle. I have already remarked, in the appendix to my recent practical work on "Tapeworms" (p. 83), that the species in its adult state may turn out to belong to one of the higher carnivora, and not to man. Lastly, I may add that Mr. Simonds and myself have conducted a number of experiments with *Trichina*, the results of which I shall lay before the Society shortly.

On *Pauropus*, a New Type of Centipede. By Sir JOHN LUBBOCK, Bart., V.P. Linn. Soc., Pres. Ent. Soc., V.P. Ethn. Soc., F.R.S., &c.

[Read December 6, 1866.]

THE subject of the following communication is a small, white, bustling, intelligent, little creature, about $\frac{1}{25}$ of an inch in length, and may be characterized as follows:—

Body composed of ten segments, including the head, convex, with scattered hairs. Nine pairs of legs. Antennæ 5-jointed, bifid at the extremity, and bearing three, long, jointed appendages.

The author has met with this little Centipede in some numbers, among Thysanura, &c., in his kitchen-garden. He was at first disposed to regard it as a larva; but having, during the last three months, had several hundred specimens under examination without finding any in a more advanced condition, and having found spermatozoa in several, he thought there could be no doubt that it is a mature form.

The body is rather narrower in front. The head consists of two segments; the third segment bears one pair of legs; the fourth, fifth, sixth, and seventh two pairs each. Strictly speaking, however, each of these segments is double. The posterior legs are the longest. Each segment, from the third to the seventh, has on the side a pair of strong bristles. There are also several transverse rows of short club-shaped hairs. The eyes are large and oval. The antennæ are very remarkable, and quite unlike those of any other Myriapods. They are 5-jointed and bifid at the extremity. The first four segments are short. The two branches constituting the fifth are longer and unequal. One bears a single appendage, the other two, long, many-jointed appendages. The mouth consists of two pairs of minute organs; the anterior ones toothed, the posterior pointed. Between the second pair of legs are two processes, which probably form part of the generative organs.

The author has been able to trace the development. The smallest specimens met with have three pairs of legs, and the number increases at each moult; but it is remarkable that whereas two pairs are acquired in the first, so that the number rises from three pairs to five, at the subsequent moults a single additional pair only is obtained.

A second species of the genus was found with the first. It is, however, much rarer, and differs in the form of the antennæ.

Sir John then proceeded to make some remarks on the systematic position of the Myriapoda, which he regarded as forming a class, and he expressed the opinion that the genus now described approached the other Articulata more nearly than any Myriapod hitherto known. Nor did he think that *Pauropus* could be placed in either of the two great groups of Myriapoda, which may be characterized as follows :—

CHILOPODA. Antennæ with not *fewer* than fourteen segments. One pair modified into powerful footjaws. Generative organs opening at the posterior end of the body. Legs in single pairs.

DIPLOPODA. Antennæ with not *more* than seven segments. No footjaws. Generative organs opening at the anterior part of the body. Legs, after the first six, arranged in double pairs.

Pauropus, at first sight, looks most like a Chilopod. Its activity, the compactness of its body, the dorsal plate, and elongated hind legs give it much the appearance of a very minute *Lithobius*. A closer examination, however, does not favour this view. The antennæ have only five segments; the powerful footjaws are absent; and the generative organs appear to open anteriorly.

Nor can *Pauropus* be classed among the Diplopods. It is true that the eight posterior legs correspond to four dorsal plates; nevertheless it is evident that in reality each pair belongs to a separate segment, as may clearly be seen if we look at the animal from beneath. In one sense, this is true also of the Diplopods; but they invariably have the legs attached by double pairs, while those of *Pauropus* are equidistant. Moreover, in all Diplopods the first three pairs of legs are distinguished from the rest by possessing each a distinct segment, whereas in *Pauropus* this is the case with the first pair only. In Diplopods, again, the legs are equal, and terminate in a simple claw, which is not the case in *Pauropus*. The mouth-parts, though very different from those of the Chilopods, are perhaps even less like those of the Diplopods. The eyes and antennæ are also very different.

Thus, then, *Pauropus* differs greatly from either of the two great orders of Centipedes. It forms a connecting link not only between the Myriapods and other Articulata, but also between the Chilopoda and Diplopoda.

Characters of some undescribed Heterocerous Lepidoptera. By
FRANCIS WALKER, Esq., F.L.S.

[Read June 7, 1866.]

ALL the following species were discovered at Bogota, and are in the collection of E. Birchall, Esq., who has kindly allowed me to describe them.

The descriptions are preceded by a list of the species, and by a few remarks on some of the families and genera in which the species are included.

Tribe NOCTUITES.

Fam. HEMICERIDÆ.

Gen. HEMICERAS, *Guen.*

H. subochraceum.

Fam. HOMOPTERIDÆ.

Gen. HOMOPTERA, *Boisd.*

H. fimbripes.

H. paupera.

Fam. CATEPHIDÆ.

Gen. VESPOLA, n.

V. cæruleifera.

Fam. PHYLLODIDÆ.

Gen. TETRISIA, n.

T. florigera.

Fam. EREBIDÆ.

Gen. BRUJAS, *Guen.*

B. bigutta.

Gen. LETIS, *Hübner.*

L. securivitta.

Gen. SYRNIA, *Hübner.*

S. albifimbria.

Fam. OMMATOPHORIDÆ.

Gen. ALLIA, n.

A. ocellata.

Gen. ERYMELLA, n.

E. hieroglyphica.

Fam. OPHIUSIDÆ.

Gen. VARIA, n.

V. rubiginosa.

Fam. POAPHILIDÆ.

Gen. PHURYS, *Guen.*

P. teligera.

Gen. BATIA, n.

B. squamicosta.

Fam. THERMESIIDÆ.

Gen. THERMESIA, *Hübner.*

T. bipustulata.

Gen. MANDELA, n.

M. crocea.

Tribe DELTOIDITES.

Fam. HYPENIDÆ.

Gen. HYPENA, *Schr.*

H. megaspila.

Gen. LAMETIA, *Walk.*

L. retusa.

Fam. HERMINIDÆ.

Gen. CASPERIA, n.

C. erebipennis.

Tribe GEOMETRITES.

Fam. URAPTERYDÆ.

Gen. CHÆRODES, *Guen.*

C. bogotaria.

Gen. CLYSIA, *Guen.*

C. discolor.

Fam. ENNOMIDÆ.

Gen. AZELINA, *Guen.*

A. saturata.

Fam. CENOCHROMIDÆ.

Gen. NORSIA, n.

N. vineta.

Fam. BOARMIDÆ.

Gen. BOARMIA, *Treit.*

B. demissaria.

Fam. ACIDALIDÆ.

Gen. ACIDALIA, *Treit.*

A. fulvicosta.

Fam. MICRONIDÆ.

Gen. MICRONIA, *Guen.*

M. metargyria.

Fam. EMPLOCIDÆ.

Fam. FIDONIDÆ.

Gen. TORA, n.

Gen. ISSA, n.

T. unilinea.

I. munda.

Fam. HEMICERIDÆ.

Hemiceras, the typical genus of this family, is wholly American, and extends from Canada to Brazil. The species here described has much affinity to *H. metastigma*; but the latter has white hind wings.

Fam. HOMOPTERIDÆ.

The genus *Homoptera* is mostly American, and the species are very numerous. The two species here described are much smaller than most of the others in the genus.

Fam. CATEPHIDÆ.

Some of the genera included in this family are very different from each other in structure. The new genus *Vespola* has most affinity to *Stictoptera* and to *Lophoptera*, but may be distinguished by the slender and very long palpi.

Fam. PHYLLODIDÆ.

Tetrisia has a remarkable resemblance to the Asiatic genus *Phyllodes*, from which it may chiefly be distinguished by the great length of the 3rd joint of the palpi.

Fam. EREBIDÆ.

The Erebidæ exceed in size all the other Noctuities; and the South-American species are larger and much more numerous than those of Asia. The Bombycites and the Geometrites have the greatest development in South Asia; and the Tineites of Australia and of New Zealand, including the Cossidæ and the Hepialidæ far surpass all others in dimensions.

The sameness of colouring in the wings of *Brujas bigutta*, and the white dot near the interior angle of the fore wings, distinguish it from *B. basicincta*, *B. Rengus*, and *B. posterior*. *Letis securifera* has most resemblance to *L. occidua*, from which it is chiefly distinguished by the testaceous patch on the interior angle of the fore wings, and by the fewer markings on the hind wings.

The white fringe of the wings and the more angular hind wings distinguish *Syrnia albifimbria* from *S. Iphianassa*.

Fam. OMMATOPHORIDÆ.

This family is especially Asiatic; and the two new genera here characterized recede much from the typical structure. The very long 3rd joint of the palpi is the chief distinctive character of *Allia*. *Erymella* hardly belongs to the Ommatophoridæ.

Fam. OPHIUSIDÆ.

The woolly covering of the pectus, of the base of the abdomen beneath, and of the legs distinguishes *Varia*. It may be considered an aberrant form of the Ophiusidæ.

Fam. POAPHILIDÆ.

Phurys teligera differs very much from all the other species of the genus; it is most like *P. basilaris*, but there is no longitudinal streak near the base of the fore wing.

The curved palpi and the structure of the fore wings distinguish *Batia* from *Poaphila* and from *Phurys*.

Fam. THERMESIDÆ.

Thermesia bipustulata is nearly allied to *T. prospera*; but the wings are without the postmedial white line which characterizes the latter species.

Mandela has most affinity to *Ephyrodes*; but the wings are festooned, and the exterior border of the hind wings is not angular.

Fam. HYPENIDÆ.

Hypena megaspila is most allied to *H. pilosalis*; but the latter has no concise silvery line along the patch of the fore wings.

The more porrect tips of the fore wings distinguish *Lametia retusa* from *L. ignitalis*. *Plusiodonta anaitoides* (Cat. Lep. Het. xxxiii. 843) may be transferred to this genus.

Fam. HERMINIDÆ.

In this family *Casperia* belongs to a distinct group, of which *Mesopia* is the only other representative. *Mastygophora* and *Palthis* are the types of two neighbouring groups.

Fam. URAPTERYDÆ.

The genus *Chærodes* extends from Nova Scotia to Rio Janeiro. *Clysia* is a South-American genus; and *C. discolor* has a general

resemblance to *C. pardipennaria*, but there are no black spots on the wings.

Fam. ENNOMIDÆ.

The section of *Azelina* here described includes *A. variaria* and *A. honestaria*.

Fam. ŒNOCHROMIDÆ.

Norsia has some affinity to *Auxima*; and these two genera hardly belong to the Œnochromidæ, for they are very different in structure from the Australian groups of that family.

Fam. BOARMIDÆ.

Boarmia demissaria is described in the Catalogue of Lepidoptera Heterocera, xxi. 357; but the specimen there mentioned was injured, and the description is consequently incomplete.

Fam. ACIDALIDÆ.

The genus *Acidalia* is exceedingly numerous in species, and inhabits all parts of the world. *A. fulvicosta* is very distinct from all the other South-American species.

Fam. MICRONIDÆ.

The genus *Micronia* extends from West Africa through Hindostan, Ceylon, and China to Australasia and Australia; it has no known representative in South Africa. *M. metargyria* is the only American species yet known, and is most allied to the West-African *M. erycinaria*; it has also some affinity to *Meleaba theclaria*, the type of a neighbouring South-American genus.

Fam. FIDONIDÆ.

The structure of the palpi and of the antennæ will distinguish the genus *Issa* from *Pachydia*, to which it has some resemblance.

Fam. EMPLOCIDÆ.

Tora, the new genus here described, is quite different from *Emplocia* in the structure of the wings.

HEMICERAS SUBOCHRACEUM. *Mas.* Rufescenti-cervinum, capite bifasciculato, palpis erectis articulo 3° minimo, antennis dimidio basali subpectinatis; alis anticis lineis duabus nigricantibus angulosis valde

indeterminatis, linea exteriore punctis nigris cinereo marginatis; alis posticis flavescenti-cinereis, fascia marginali lata rufescenti-cervina.

Male. Reddish fawn-colour, yellowish cinereous beneath. Head with a small erect tuft on each side between the antennæ. Palpi stout, pubescent, erect, not rising higher than the vertex; 3rd joint extremely small. Antennæ slightly pectinated to nearly the middle. Abdomen slightly tufted above near the base, extending somewhat beyond the hind wings; apical tuft compressed, very small. Legs stout; femora and tibiæ pilose. Fore wings with two zigzag very indistinct blackish lines and with an exterior more oblique line of black cinereous-bordered points. Hind wings yellowish cinereous, with a broad reddish fawn-coloured marginal band. Length of the body 11 lines; of the wings 24 lines.

HOMOPTERA FIMBRIPES. *Mas.* Fusca, fasciculo frontali acuto; palpis suberectis verticem longe superantibus, articulo 3^o lanceolato; tarsis late fimbriatis; alis fascia nigra undulata e lineis tribus approximatis, lineis duabus exterioribus nigricantibus angulosis indistinctis; alis anticis fascia antemedia e lineis tribus approximatis.

Male. Brown, cinereous beneath. Frontal tuft prominent, acute. Palpi nearly erect, rising much higher than the vertex; 3rd joint lanceolate, cinereous at the base and at the tip, rather shorter than the 2nd. Antennæ setose. Thorax squamous. Abdomen extending much beyond the hind wings; apical tuft small. Tibiæ broadly fringed. Wings with a middle undulating black band, which is composed of three approximate lines; two exterior indistinct zigzag blackish lines; marginal points black. Fore wings with a band near the base like the one before mentioned. Length of the body 7 lines; of the wings 16 lines.

HOMOPTERA PAUPERA. *Fœm.* Fusca; palpis erectis verticem longe superantibus, articulo 3^o lanceolato; alis spatio marginali obscuriore, fascia median igricante angulosa; alis anticis fascia antemedia angulosa.

Female. Brown, cinereous beneath. Palpi erect, rising much higher than the vertex; 3rd joint lanceolate, much more slender than the 2nd, and little more than half its length. Wings with a middle zigzag blackish band; space along the exterior border darker than the ground-hue; marginal points black. Fore wings slightly acute, with a blackish band near the base; exterior border slightly rounded, hardly oblique. Length of the body 5 lines; of the wings 13 lines.

Gen. VESPOLA.

Mas. Corpus sat validum. Palpi graciles, oblique ascendentes, verticem sat superantes; articulus 2^{us} subarcuatus; 3^{us} rectus, linearis, 2^o paullo brevior. Abdomen alas posticas dimidio

superans; fasciculus apicalis parvus. *Pedes* robusti, squamosi; calcaria longa, gracilia. *Alæ* anticæ elongatæ, acutæ, margine exteriore perobliquo.

Male. Body moderately stout. Palpi slender, obliquely ascending, rising rather higher than the vertex, much longer than the breadth of the head; 2nd joint slightly curved; 3rd straight, linear, a little shorter but hardly more slender than the 2nd. Abdomen extending for half its length beyond the hind wings; apical tuft small. Legs stout, squamous; spurs long, slender. Wings elongate, moderately broad. Fore wings acute; exterior border slightly convex, very oblique.

VESPOLA CÆRULEIFERA. *Mas*. Cupreo-ferruginea, abdomine plagis duabus lateralibus cyanescenti-argenteis plagaque basali ventrali alba; alis anticis pallidiore subvariis, linea angulosa postmedia atomisque argenteis, subtus cyaneo plagiatis; alis posticis disco cyaneo.

Male. Cupreous-ferruginous. Abdomen with a large bluish silvery patch on each side, and with a large white patch at the base beneath. Joints of the tarsi with white tips. Fore wings slightly mottled with a somewhat paler hue, irregularly adorned with silvery speckles and with a postmedial zigzag line of the same hue; underside with patches of bright blue scales. Hind wings bright blue in the disk, this hue more prevalent on the underside. Length of the body 8 lines; of the wings 17 lines.

Gen. TETRISIA.

Fæm. Corpus robustum. *Frons* conicus. *Proboscis* brevis. *Palpi* validi, pubescentes, oblique ascendentes, verticem longissime superantes; articulus 3^{us} subclavatus, subfimbriatus, 2^o paullo longior. *Antennæ* sat graciles. *Abdomen* alas posticas paullo superans, basi subtus dense pilosum. *Pedes* robusti; femora pilosa; calcaria longa. *Alæ* amplæ; anticæ, acutæ, costa perparum convexa, margine exteriore perobliquo.

Female. Body stout. Front prominent, conical. Proboscis short. Palpi stout, pubescent, obliquely ascending, rising very much higher than the vertex; 3rd joint subclavate, slightly fringed above, a little longer than the 2nd. Antennæ rather slender. Abdomen tapering from the base to the tip, densely pilose near the base, extending a little beyond the hind wings. Legs stout; femora pilose; spurs long. Wings long, broad. Fore wings acute; costa very slightly convex; exterior border slightly convex, very oblique; 2nd inferior vein as near to the 3rd as to the 1st; 4th remote from the 3rd.

TETRISIA FLORIGERA. *Fæm.* Obscure fusca; alis anticis lunula media nigra, fascia exteriore obliqua e maculis nigricantibus, macula subtus alba maxima; alis posticis nigris, macula maxima rosea.

Female. Dark brown. Body a little paler beneath. Fore wings with a black lunule at the end of the areolet, and with an oblique band of irregular blackish spots at half the length between the lunule and the exterior border; underside with a very large white spot near the interior angle. Hind wings black; a very large rosy spot near the interior angle, equally apparent on the underside. Length of the body 18 lines; of the wings 45 lines.

BRUJAS BIGUTTA. *Mas.* Fusca; alis fascia marginali subpallidiore, lineis tribus angulosis lunulisque submarginalibus nigricantibus, his albo marginatis; alis anticis macula postica alba, orbiculari nigricante cinereo marginata, reniformi cinereo marginata lituras duas nigricantes includente.

Male. Brown, cinereous brown beneath. Palpi erect, rising very much higher than the vertex; 2nd joint with a very short fringe in front; 3rd linear, cinereous at the tip, more slender than the 3rd, but nearly as long. Antennæ setose. Abdomen a little shorter than the interior border of the hind wings; apical tuft compressed, very small. Wings with a slightly paler marginal band; three blackish zigzag lines, of which the 2nd in the fore wings is nearer the outer side of the reniform mark; submarginal lunules blackish, white-bordered on the outer side: underside with a postmedial black zigzag line and with a diffuse blackish submarginal band, which contains a slightly undulating cinereous line; submarginal lunules cinereous-bordered. Fore wings with a white spot near the interior angle; orbicular and reniform marks cinereous-bordered, the former blackish, the latter containing a small blackish mark on each side: underside with two black dots, which represent the orbicular and reniform marks. Hind wings beneath with a black fusiform mark in the areolet. Length of the body 11 lines; of the wings 27 lines.

LETIS SECURIVITTA. *Fæm.* Cinereo-fusca, thorace fascia postica pallide ochracea; alis anticis vitta strigam latissimam emittente plagaque postica magna pallide ochraceis connexis, orbiculari et reniformi magnis nigricantibus albido marginatis, linea submarginali e strigis nigris, striga subapicali obliqua pallide ochracea; alis posticis fascia cervina lineas duas nigricantes denticulatas albo marginatas includente, linea exteriore subundulata pallide ochracea.

Female. Brown, cinereous-tinged. Palpi erect, rising very much higher than the vertex; 2nd joint with a short thick fringe in front; 3rd linear, slender, rather shorter and very much more slender than the 2nd. Antennæ minutely setulose. Thorax with a pale ochraceous band on its hind border. Wings beneath with three pale ochraceous lines in the middle and with a black point in the disk nearer the base. Fore

wings with a pale ochraceous stripe, which joins the band of the thorax and emits an extremely broad streak to the costa, and is connected with a large pale ochraceous patch, which joins the interior angle; this stripe is traversed by two oblique zigzag pale ochraceous black-bordered lines, of which the 2nd is white near the interior border; orbicular and reniform marks large, blackish, whitish-bordered; a black submarginal line composed of connected fusiform streaks; three white costal points near the tip, and an oblique undulating pale ochraceous subapical streak. Hind wings with an irregular fawn-coloured middle band, which contains two blackish denticulated partly white-bordered lines, and is bordered on its outer side by an undulating black line; a slightly undulating pale ochraceous line near the submarginal line, which is like that of the fore wings. Length of the body 16 lines; of the wings 58 lines.

SYRNIA ALBIFIMBRIA. Fœm. Obscure fusca; alis lineis tribus nigricantibus angulosis cinereo marginatis, linea exteriori nigra dentata ochraceo marginata, linea adhuc exteriori alba indeterminata, fimbria alba basi nigra; alis anticis macula orbiculari et reniformi magnis ochraceo pallido marginatis; alis posticis margine exteriori dentato uniangulato.

Female. Dark brown, pale brown beneath, minutely whitish-speckled. Palpi erect, rising much higher than the vertex; 2nd joint slightly curved, applied to the head, with a short thick dull ochraceous fringe in front; 3rd linear, cinereous at the tip, rather shorter and very much more slender than the 2nd. Antennæ minutely pubescent. Abdomen with a blue tinge, much shorter than the interior border of the hind wings. Tips of the tibiæ and of the joints of the tarsi dull ochraceous. Wings with three blackish zigzag partly cinereous-bordered lines, and with an exterior more distinct black dentate ochraceous-bordered line, beyond which there are traces of a white line; submarginal line black, festooned; fringe white, black at the base: underside with a black antemedial cinereous-bordered spot in the disk, with a postmedial dark-brown slightly undulating partly whitish-bordered line, and with traces of an exterior white line. Fore wings acute; orbicular and reniform marks large, of the ground-hue, bordered with pale ochraceous; exterior border straight. Hind wings with the exterior border dentate, angular in the middle. Length of the body 15 lines; of the wings 42 lines.

Gen. ALLIA.

Mas. Corpus robustum, læve. Proboscis mediocris. Palpi erecti, verticem superantes; articulus 3^{us} linearis, 2^o. paullo longior. Antennæ setulosæ. Abdomen alas posticas non superans; fasciculus apicalis minimus, subcompressus. Pedes robusti; femora dense pilosa; calcaria longa. Alæ breves, latæ, margine exteriori subobliquo, anticæ subacutæ.

Male. Body stout, smooth. Proboscis moderately long. Palpi smooth, erect, twice as long as the breadth of the head, rising very much higher than the vertex; 3rd joint linear, a little longer and much more slender than the 2nd. Antennæ setulose. Abdomen not extending beyond the hind wings; apical tuft very small, slightly compressed. Legs stout; femora densely pilose; spurs long. Wings short, broad; exterior border convex, slightly oblique; an additional vein in each space between the veins that extend to the exterior border. Fore wings slightly acute.

ALLIA OCELLATA. Mas. Ferrugineo-fusca; alis anticis lineis duabus angulosis obscure fuscis, macula reniformi longa angusta fusco marginata, ocello postico nigro punctum album includente ochraceo fuscoque marginato, plaga exteriore chalybea; alis posticis plagis duabus chalybeis, linea submarginali obscure fusca cinereo marginata.

Male. Ferruginous brown, cinereous brown beneath. Wings with two dark-brown lines which are zigzag in the fore wings and undulating in the hind wings. Fore wings with a long narrow dark-brown-bordered reniform mark, which is between the lines, as is also a black ocellus on the interior border; this ocellus has a white point in its centre and an orange border, which latter is bordered with dark brown; a chalybeous patch on the outer side of the ocellus; two dark-brown lines near the base, the 2nd undulating; an abbreviated brown line near the exterior border, very diffuse on its inner side. Hind wings with two chalybeous patches, one between the lines, the other between the 2nd line and a dark-brown cinereous-bordered submarginal line, which is intercepted and forms two black dots where it joins the patch. Wings beneath with a dark-brown point in the disk, with a postmedial denticulated dark-brown line and with black marginal points. Length of the body 9 lines; of the wings 24 lines.

Gen. ERYMELLA.

Mas. Corpus robustum, læve. *Proboscis* mediocris. *Palpi* validi, squamosi, oblique ascendentes, verticem longe superantes; articulus 3^{us} linearis, 2^o valde brevior. *Antennæ* pubescentes. *Thorax* tegulis posticis longis truncatis. *Abdomen* alas posticas paullo superans; fasciculus apicalis minimus. *Pedes* robusti; femora fimbriata; calcaria longa, gracilia. *Alæ* elongatæ, sat angustæ, anticæ acutæ; margine exteriore perobliquo.

Male. Body stout, smooth. Proboscis of the usual length. Palpi stout, squamous, obliquely ascending, rising much higher than the vertex; 3rd joint linear, much shorter than the 2nd. Antennæ minutely pubescent. Hind tegulæ of the thorax long,

truncate at the tips. Abdomen extending a little beyond the hind wings; apical tuft very small. Legs stout; femora fringed; spurs long, slender. Wings elongate, rather narrow. Fore wings acute; exterior border convex, very oblique.

ERYMELLA HIEROGLYPHICA. *Mas.* Cinereo-fusca, capite thoraceque fuscis; alis linea e punctis albis elongatis, punctis marginalibus nigris; alis anticis spatio basali fusco, linea antemedia obscure fusca, guttis tribus mediis nigris, plaga exteriore magna nigricante.

Male. Cinereous brown. Head and thorax brown. Abdomen and underside brownish cinereous. Wings with a line of elongated white points on the veins, abbreviated on the outer side of the reniform mark in the fore wings; marginal points black. Fore wings with a brown basal space which is limited by a darker brown line; three black dots in the disk, the 2nd on a diffuse dark brown line, the 3rd capitate; a large exterior blackish patch joining the costa. Length of the body 7 lines; of the wings 19 lines.

Gen. VABIA.

Mas. *Corpus* crassum. *Proboscis* mediocris. *Palpi* breves, erecti, verticem longe superantes; articulus 3^{us} linearis, 2^o dimidio longior. *Antennæ* setosæ. *Abdomen* alas posticas sat superans; fasciculus apicalis parvus. *Pedes* validi, fimbriati; calcaria longissima. *Alæ* latæ; anticæ acutæ, subfalcatæ.

Male. Body very stout. Proboscis of the usual length. Palpi smooth, erect, rising much higher than the vertex; 3rd joint linear, much more slender than the 2nd, and rather more than half its length. Antennæ setose. Abdomen extending rather beyond the hind wing; apical tuft small. Legs stout; femora and tibiæ fringed; spurs very long. Wings broad. Fore wings acute, subfalcate; exterior border convex, moderately oblique; 3rd inferior vein very near the 2nd, 4th very remote. Hind wings with an oblique interior border; interior angle prominent.

VABIA RUBIGINEA. *Mas.* Ferrugineo-rufa; alis anticis subglaucescentibus, lineis duabus obscurioribus obliquis undulatis, 2^a punctis albis ornata, linea exteriore e punctis fuscis cinereo marginatis; alis anticis macula orbiculari et reniformi maximis, orbiculari cinerea punctum fuscum includente, reniformi cinereo varia, linea antemedia fusca angulosa indistincta.

Male. Ferruginous red, cinereous beneath except the fringe of the wings. Fore tibiæ with white tips; tips of the tarsal joints white; spurs with white bands. Wings slightly glaucous-tinged, with two darker oblique

undulating lines—one antemedial, the other postmedial (accompanied by white points); an exterior line of brown cinereous-bordered points. Fore wings with a cinereous mark between the 2nd and 3rd lines; orbicular and reniform marks very large; orbicular round, cinereous, with a brown point in the middle; reniform partly cinereous; an indistinct zigzag brown line near the base; underside with a blackish lunule in the disk. Length of the body 11 lines; of the wings 26 lines.

PHURYS TELIGERA. *Eæm.* Cervina; alis anticis vitta postica cinerea nigro conspersa strigaeque fusca lata cinereo marginata; alis posticis fuscescenti-cinereis.

Female. Fawn-colour. Palpi smooth, slender, nearly erect, rising a little higher than the vertex; 3rd joint lanceolate, a little more than half the length of the 2nd. Hind tegulæ of the thorax very long. Abdomen not extending beyond the hind wings. Wings with a brown marginal festoon. Fore wings with a cinereous black-speckled stripe along the interior border and with a broad brown cinereous-bordered streak, which rests on the stripe and extends to the tip. Hind wings brownish cinereous. Length of the body 8 lines; of the wings 20 lines.

Gen. BATIA.

Mas. *Corpus* robustum læve. *Proboscis* mediocris. *Palpi* graciles, squamosi, arcuati, ascendentes, verticem non superantes; articulus 3^{us} lanceolatus, 2^o valde brevior. *Antennæ* graciles, pubescentes. *Thorax* squamosus. *Abdomen* alas posticas non superans; fasciculus apicalis parvus. *Pedes* læves, sat graciles; calcaria longa, gracilia. *Alæ* latæ; anticæ acutæ, fasciculo subcostali munitæ, margine exteriore perparum obliquo.

Male. Body stout, smooth. Proboscis of the usual length. Palpi slender, squamous, curved, ascending, not rising higher than the vertex; 3rd joint lanceolate, much shorter than the 2nd. Antennæ slender, minutely pubescent. Thorax squamous. Abdomen not extending beyond the hind wings; apical tuft small. Legs smooth, rather slender; spurs long, slender. Wings broad. Fore wings acute; exterior border convex, very slightly oblique; a costal tuft beyond the middle above, and a subcostal tuft before the middle on the underside.

BATIA SQUAMICOSTA. *Mas.* Ferrugineo-rufa, abdomine alisque posticis nigricanti-cinereis; alis anticis nigricante subconsersis lineis duabus cinereis, 1^a recta, 2^a apud costam reflexa.

Male. Ferruginous red. Abdomen, hind wings, and underside blackish cinereous. Fore wings very minutely blackish-speckled; two cinere-

ous lines; first line antemedial, straight; second postmedial, oblique, much reflexed near the costa and joining the tuft. Length of the body 6 lines; of the wings 17 lines.

THERMESIA BIPUSTULATA. *Fæm.* Ferrugineo-rufa; palpis erectis, verticem longe superantibus, articulo 3^o lineari 2^o brevior; alis lineis tribus nigricantibus undulatis indistinctis, 3^a punctis albis comitata; alis anticis plaga costali subapicali ochracea albo marginata macula orbiculari et reniformi parvis nigricantibus, linea 1^a punctis albis comitata.

Female. Ferruginous red, cinereous beneath. Palpi erect, slender, rising much higher than the vertex; third joint linear, rather shorter and more slender than the second. Abdomen not extending beyond the hind wings. Legs smooth, rather slender. Wings with three indistinct blackish undulating lines; third line postmedial, accompanied by white points. Fore wings acute, with a costal subapical ochraceous white-bordered patch; orbicular and reniform marks small, blackish, between the first and second lines; first line accompanied by white points; exterior border convex, moderately oblique. Length of the body 8 lines; of the wings 17 lines.

Gen. MANDELA.

Mas. Corpus sat robustum. Proboscis mediocris. Palpi sat graciles, oblique ascendentes, verticem paullo superantes; articulus 2^{us} squamosus; 3^{us} 2^o brevior, obtusus, apicem versus subincrassatus. Antennæ setulosæ. Abdomen alas posticas per paullo superans; fasciculus apicalis compressus, minimus. Pedes læves, graciles; calcaria longa, gracilia. Alæ elongatæ, margine exteriori subdentato; alæ anticæ vix falcatæ; alæ posticæ margine exteriori sat obliquo.

Male. Body moderately stout. Proboscis of the usual length. Palpi obliquely ascending, rather slender, much longer than the breadth of the head, rising a little higher than the vertex; second joint squamous: third rather shorter than the second, slightly increasing in breadth from the base to the tip, which is obtuse. Antennæ minutely setulose. Abdomen extending very little beyond the hind wings; apical tuft compressed, very small. Legs smooth, slender; spurs long, slender. Wings elongate; exterior border festooned. Fore wings very slightly falcate; exterior border slightly convex, moderately oblique; first, second and third inferior veins approximate at the base; 4th very remote. Hind wings with the exterior border receding much from the abdomen.

MANDELA CROCEA. *Mas.* Læte lutea; capite, palpis thoraceque antico

cinereo-purpureis; abdomine fasciis quatuor purpurascenti-cinereis, ventre pedibusque albidis; alis anticis vitta costali purpurea nigricante conspersa, punctis duobus nigris, lineis tribus angulosis apud costam nigris et retractis punctoque basali læte rufis, fascia marginali rufa guttas canas includente.

Male. Bright luteous, paler beneath. Head, palpi and fore part of the thorax cinereous-purple. Abdomen with some bright-red speckles on each side of the base of the second segment, and with a purplish-cinereous band on the fore border of each of the last four segments; underside and legs whitish. Fore wings with a purple blackish-speckled costal stripe, and with a broad irregular red marginal band, which includes a line of hoary dots; a bright-red point at the base and three bright-red zigzag lines, which are retracted and black near the costa; a black point between the first line and the second, and another between the second line and the third; five white costal points near the tip; marginal lunules black; fringe blackish cinereous, white-bordered: underside red, with four irregular black lines and a postmedial black patch. Hind wings with an irregular antemedial red band which contains an irregular white blackish-bordered line; an exterior blackish line and three more exterior lines composed of red points, some of the points in the second line marked with blackish; marginal line red, with a blackish festoon; fringe paler than that of the fore wings: underside with three blackish denticulated lines, of which the third is interrupted. Length of the body 5 lines; of the wings 14 lines.

HYPENA MEGASPILA. *Fæm.* Obscure fusca; alis anticis cervinis, purpurascenti-cinereo tinctis, plaga trigona maxima obscure fusca albido marginata, linea exterior fusca lineaque adhuc exterior e lituris parvis fuscis.

Female. Dark brown, slender. Frontal tuft porrect, acute, very prominent. Abdomen and underside dark cinereous. Legs slender. Fore wings acute, fawn-colour, suffused with purplish cinereous; a very large dark-brown whitish-bordered triangular patch, which occupies the whole costa except at the base and at the tip, and extends nearly to the interior border; a brown line nearly parallel to the outer side of the patch, and an irregular more exterior line of small brown marks; exterior border slightly convex, rather oblique. Length of the body 5 lines; of the wings 14 lines.

LAMETIA RETUSA. *Fæm.* Ferrugineo-rufa; palpis oblique ascendentibus, verticem longe superantibus; abdomine subtus pallide luteo; alis anticis chalybeo suffusis, apice retusis, fascia marginali lata aurata; alis posticis luteis, fascia marginali lata nigricante.

Female. Ferruginous red. Frontal tuft prominent. Palpi obliquely ascending, rising much higher than the vertex. Abdomen extending

rather beyond the hind wings, pale luteous beneath. Fore wings chalybeous-tinged with the exception of a broad dark gilded marginal band; fringe red; tips retuse. Hind wings bright luteous, with a broad blackish band which blends with the ferruginous hue along the exterior border. Length of the body $9\frac{1}{2}$ lines; of the wings 22 lines.

Gen. CASPERIA.

Mas. *Corpus* robustum. *Proboscis* mediocris. *Palpi* supra thoracem reflexi; articulus 2^{us} fimbriatus; 3^{us} fasciculatus, 2^o vix brevior. *Antennæ* setosæ. *Abdomen* alas posticas non superans; fasciculus apicalis compressus, minimus. *Pedes* antici usque ad tarsorum apices densissime fasciculati. *Alæ* anticæ amplæ, acutæ, fimbria costali brevi reflexa, margine exteriori vix obliquo; posticæ margine exteriori subangulato.

Male. Body stout. *Proboscis* moderately long. *Palpi* reflexed over the head and the thorax, and extending nearly to the hind border of the latter; second joint with a short thick fringe; third nearly as long as the second, clothed from the base to the tip with a long thick clavate tuft of hairs. *Antennæ* setose. *Pectus* clothed with long hairs. *Abdomen* not extending beyond the hind wings; apical tuft compressed, very small. *Legs* stout; spurs long. Fore legs clothed nearly to the tips of the tarsi with a very thick mass of hairs. Posterior femora and hind tibiæ fringed. Wings long, broad; intermediate veins distinct towards the exterior border. Fore wings acute; a short reflexed costal fringe along one-fourth of the length from the base; exterior border slightly rounded, hardly oblique. Hind wings with the exterior border slightly angular near the interior angle.

CASPERIA EREBIPENNIS. *Mas.* Obscure fusca, palpis pedibusque anticis cervino pilosis; alis fascia postmedia cervina indistincta lineam nigram dentatam includente, linea exteriori cervina pallidiore angulosa, lunulis marginalibus nigris ochraceo marginatis; alis anticis guttis duabus ochraceis, linea antemedial nigra dentata.

Male. Dark brown, cinereous brown beneath. *Palpi* and fore legs clothed with fawn-coloured hairs. Wings with an indistinct fawn-coloured postmedial band which includes a dentate black line; an exterior paler fawn-coloured zigzag line; marginal lunules black, bordered with ochraceous. Fore wings with a black dentate line at a little beyond one-third of the length from the base; an ochraceous subcostal dot nearer the base; another ochraceous dot in the arcole. Length of the body 12 lines; of the wings 34 lines.

CHÆRODES BOGOTARIA. *Mas.* Cinereo-ferruginea; alis fusco conspersis, fusco pallido subnebulosis, linea obliqua lineaque exteriori lata angulosa obscure fuscis; alis anticis falcatis, linea 1^a subarcuata, linea antemedia obscure fusca, strigula media argentea; alis posticis linea 1^a angulosa, margine angulato.

Male. Cinereous ferruginous, more cinereous beneath. Palpi obliquely ascending, not rising so high as the vertex; third joint lanceolate, not more than one-half of the length of the second. Antennæ slender. Abdomen shorter than the interior border of the hind wings. Wings minutely and transversely brown-speckled, slightly clouded with pale brown; a dark-brown line which is zigzag in the hind wings and slightly curved inwards in the fore wings, and extends from the middle of the interior border of the hind wings to near the tips of the fore wings, where it is acutely retracted to the costa; a broad exterior dark-brown zigzag line, which is abbreviated in the fore part of the fore wings: underside with an irregular brown marginal band. Fore wings very falcate; a dark-brown oblique line near the base; a little transverse undulating silvery streak at the end of the areolet. Hind wings with the exterior border angular in the middle. Length of the body 8 lines; of the wings 28 lines.

CLYSIA DISCOLOR. *Fœm.* Subochracea; alis fusco et nigricante strigatis, fasciis duabus indeterminatis flavescenti-cinereis maculis albidis comitatis, linea submarginali nigricante lata angulosa cinereo varia, margine exteriori angulato; alis anticis falcatis, plaga antemedia flavescenti-cinerea; alis posticis marginis exterioris angulo magis determinato.

Female. Dull ochraceous, cinereous beneath. Palpi obliquely ascending, not rising so high as the vertex. Abdomen much shorter than the interior border of the hind wings. Wings minutely and transversely streaked with brown and with blackish; two incomplete and irregular yellowish-cinereous bands, each of which is accompanied by a few whitish spots, one of the latter represents the reniform mark and contains a black point; submarginal line broad, blackish, zigzag, varied with cinereous, exterior border forming an angle: underside with an irregular whitish marginal band. Fore wings falcate, with a yellowish cinereous patch near the base. Hind wings with the angle of the exterior border much more prominent and acute than that of the fore wings, and with two more distinct anterior teeth. Length of the body 10 lines; of the wings 28 lines.

Gen. AZELINA.

Sectio nova.

Fœm. *Corpus* crassum. *Proboscis* robusta, sat longa. *Palpi* robusti, porrecti, caput perpaullo superantes; articulus 2^{us} brevissime fimbriatus, 3^{us} minimus. *Antennæ* graciles. *Abdomen*

lineare, fasciculis quatuor parvis lateralibus. *Pedes* robusti; calcaria brevissima. *Alæ* amplæ, margine exteriore dentato.

Female. Body thick. Proboscis stout, moderately long. Palpi stout, porrect, extending very little beyond the head; second joint with a very short fringe; third extremely small. Antennæ slender. Abdomen linear, hardly as long as the interior border of the hind wings, with two small tufts on each side near the tip. Legs stout, smooth; spurs very short. Wings long, broad; exterior border irregularly dentate. Fore wings acute; exterior border slightly rounded, rather oblique.

AZELINA SATURATA. *Fem.* Fusca; alis anticis striga alba angulata, linea antemedia nigricante angulosa apud costam atra et dilatata, lineis duabus postmediis nigricantibus subundulatis fere contiguis, 2^a antice atra postice diffusa, linea exteriore dentata strigaeque adhuc exteriore lanceolata nigro marginata chalybeis, punctis quinque albis submarginalibus; alis posticis linea postmedia fusca albido marginata, guttis quatuor marginalibus atris.

Female. Brown, cinereous-brown beneath. Fore wings with a white angular streak on the disk; an antemedial blackish zigzag line, which forms an angle towards the streak, whence to the costa it is deep black and dilated and retracted; two blackish postmedial oblique slightly undulating nearly connected lines; second line deep black along the fore part, diffuse along the hind part, where it is bordered on the outer side by an acutely dentate chalybeous line, the latter is connected with a lanceolate darker chalybeous broadly black-bordered streak; two exterior incomplete brown lines; five white submarginal points; a black point behind the fifth white point; underside with small pale testaceous costal marks. Hind wings with a black point in the disk and with an exterior brown whitish-bordered line; four deep-black dots along the hind part of the exterior border, successively increasing in size towards the interior angle. Length of the body 8 lines; of the wings 24 lines.

Gen. NORSTIA.

Mas. *Corpus* sat gracile. *Proboscis* mediocris. *Palpi* validi, verticem paullo superantes; articulus 2^{us} fimbriatus, oblique ascendens; 3^{us} lanceolatus, porrectus, 2ⁱ dimidio brevior. *Antennæ* crenulatæ. *Abdomen* alas posticas longe superans; fasciculus apicalis parvus. *Pedes* validi; tibiæ fimbriatæ; calcaria sat longa. *Alæ* anticæ latæ, longissimæ, vix falcatæ, margine exteriore perobliquo, margine interiore undulato.

Male. Body rather slender. Proboscis of the usual length. Palpi stout, rising a little higher than the vertex; second

joint obliquely ascending, with a short thick fringe in front; third lanceolate, porrect, about one-third of the length of the second, with which it forms an obtuse angle. Antennæ minutely crenulated. Abdomen extending much beyond the hind wings; apical tuft small. Legs stout; tibiæ with a long fringe; spurs moderately long. Wings broad, very long. Fore wings acute, hardly falcate; exterior border convex, very oblique; interior border undulating, dilated near the base, excavated beyond the middle; second inferior vein about thrice as far from the third as from the first.

NORSIA VINCTA. *Mas.* Pallide rufescens, alis anticis lineis pallide cinereis fusco marginatis, 2^a abbreviata, 3^a, 4^a, 6^a, 8^a et 9^a brevissimis, 5^a antemedia, 10^a submarginali, alis posticis cervinis fimbria pallide cinerea.

Male. Pale reddish, pale reddish-cinereous beneath. Fore wings with various oblique pale cinereous brown-bordered transverse lines. First line very near the base; second abbreviated; third and fourth very short, near the costa; fifth slightly antemedial; sixth very short; seventh more oblique than the others; eighth and ninth very short, near the interior angle; tenth near the exterior border. Hind wings fawn-colour; fringe pale cinereous. Length of the body 15 lines; of the wings 36 lines.

BOARMIA DEMISSARIA. *Mas.* Albida, palpis nigricantibus, tibiis posticis subincrassatis; alis fusco conspersis, lineis tribus e punctis nigricantibus, fascia atomosa fusca, puncto medio punctisque marginalibus nigris.

Male. Whitish. Palpi blackish, obliquely ascending, not rising higher than the vertex; third joint extremely small. Antennæ broadly pectinated. Abdomen not extending beyond the hind wings; apical tuft very small. Hind tibiæ slightly incrassated. Wings brown-speckled, with three oblique lines of blackish points; first line antemedial; second postmedial, accompanied by a very incomplete brown band, which is composed of clustering speckles; third submarginal; a blackish point in the disk between the first line and the second; marginal points black; underside with a dark-brown marginal band. Length of the body 7 lines; of the wings 22 lines.

ACIDALIA FULVICOSTA. *Fæm.* Argenteo-alba, capite antico fusco; antennis validis, pubescentibus; alis subhyalinis, cinereo conspersis; alis anticis puncto nigro; costa fulva.

Female. Silvery white. Head brown, excepting the vertex. Palpi brown. Antennæ stout, very minutely pubescent. Abdomen rather shorter than the interior border of the hind wings. Legs smooth, slender. Wings slightly hyaline, thinly and very minutely speckled

with cinereous. Fore wings acute, with a black point in the disk; costa tawny. Length of the body 5 lines; of the wings 15 lines.

MICRONIA METARGYRIA. *Fœm.* Nivea, alis lineis duabus pallide fusciscenti-cinereis, alis anticis lineis quinque; alis posticis subcaudatis, linea 2^a dilatata argenteo marginata, plaga ochracea, maculis duabus atris.

Female. Pure white. Abdomen much shorter than the interior border of the hind wings. Wings with two pale brownish-cinereous lines; first line not oblique, extending from a little beyond one-fourth of the length of the costa of the fore wings, abbreviated at some distance from the exterior border of the hind wings; second at a little beyond three-fourths of the length in the fore wings, very near the border in the hind wings. Fore wings with three additional lines, the first near the base, the second at a little beyond the middle; the third marginal. Hind wings subcaudate; second line dilated, including a little silvery streak, bordered by a silvery line, interrupted by an ochraceous patch; this is connected with two deep-black spots, of which the largest is on the subcaudate angle. Length of the body 6 lines; of the wings 21 lines.

Gen. ISSA.

Mas. *Corpus* sat validum. *Proboscis* brevis. *Palpi* graciles, ad frontem applicati, verticem non attingentes; articulus 3^{us} minimus. *Antennæ* serratæ, setosæ. *Abdomen* alas posticas non superans; fasciculus apicalis parvus, subcompressus; fasciculi duo parvi, ventrales, subapicales. *Tibiæ* densissime fimbriatæ. *Alæ* latæ, margine exteriore vix dentatæ. *Alæ* anticæ vix acutæ, margine exteriore subobliquo. *Alæ* posticæ margine interiore obliquo.

Male. Body moderately stout. *Proboscis* short. *Palpi* slender, applied to the head, not rising so high as the vertex; third joint extremely small. *Antennæ* minutely serrated, densely setose. Abdomen rather shorter than the interior border of the hind wings; apical tuft small; slightly compressed; a tuft on each side beneath near the tip. Legs with very densely fringed tibiæ. Wings broad; exterior border very slightly festooned. Fore wings hardly acute; exterior border slightly oblique, very slightly rounded. Hind wings with the interior border receding much from the abdomen.

ISSA MUNDA. *Mas.* Pallide flavescenti-cinerea, capite palpisque fuscis; alis fusco pallido subconspersis, lineis duabus angulosis pallide cervinis, linea marginali fusca, punctis marginalibus nigris; alis anticis puncto nigro, alis posticis macula nigra.

Male. Pale yellowish cinereous. Head and palpi brown. Wings very minutely speckled with pale brown; two pale fawn-coloured zigzag lines; first line antemedial, with some brown points in the fore wings, indistinct in the hind wings; second postmedial; an exterior slightly undulating line of black points; marginal festoon brown, accompanied by black points; underside with a black lunule, with two exterior dentate black lines and with a black marginal festoon, the first line indistinct. Fore wings with a black point between the first and second lines. Hind wings with a black spot between the first line and the second. Length of the body 7 lines; of the wings 20 lines.

Gen. TORA.

Mas. *Corpus* gracile. *Proboscis* brevis. *Palpi* porrecti, graciles, brevissimi; articulus 3^{us} minimus. *Antennæ* subpubescentes, sat validæ. *Abdomen* breve; fasciculus apicalis minimus. *Pedes* breves, graciles. *Alæ* amplæ. *Alæ* anticæ acutæ, margine exteriori perobliquo. *Alæ* posticæ margine exteriori subtruncato, margine interiori obliquo.

Male. Body slender. Proboscis short. Palpi porrect, slender, very short; third joint very small. Antennæ rather stout, very minutely pubescent. Abdomen much shorter than the interior border of the hind wings; apical tuft very small. Legs smooth, slender. Wings broad, elongate. Fore wings acute; exterior border slightly convex, very oblique. Hind wings with the exterior border somewhat truncated; interior border receding much from the abdomen.

TORA UNILINEA. *Mas.* Ochracea; alis anticis apice fuscis, fascia postmedia alba obliqua; alis posticis subtus fuscis, albo trivittatis.

Male. Ochraceous. Fore wings brown about the tips, with a narrow white band, which extends from five-sixths of the length of the costa to the middle of the exterior border. Hind wings brown and adorned with three white stripes on the underside; first stripe costal, extending along the exterior border to the end of the second; second a little in front of the middle of the breadth; third abbreviated, very near the interior border. Length of the body $4\frac{1}{2}$ lines; of the wings 16 lines.

Remarks on *Distoma clavatum* from a Sword-fish. By T. SPENCER COBBOLD, M.D., F.R.S., F.L.S., Lecturer on Comparative Anatomy at the Middlesex Hospital.

[Read Jan. 17, 1867.]

DURING my stay at Lynn, Norfolk, in August 1865, a fine example of the common Sword-fish (*Xiphias gladius*) was cast ashore in the estuary. Although quite dead when discovered, the creature was in a tolerably fresh condition; and when subsequently dissected by Dr. John Lowe and myself, some of its internal parasites were still alive. Respecting the structure of the fish I do not propose to offer any particulars; but it may be worth while remarking that it measured exactly ten feet and two inches from the tip of the snout to the end of the upper division of the tail. Several other careful measurements were taken, which, together with useful data regarding the natural history of the species, will, I believe, be placed on record by Dr. Lowe, who has for some years past devoted much attention to the zoology of the Norfolk estuary, and especially to the fishes.

Five different species of Entozoa were encountered in the flesh and intestinal canal of this Sword-fish—namely, *Distoma clavatum*, *Ascaris incurva*, *Bothriocephalus plicatus*, *Tetrarhynchus attenuatus*, and a form of *Scolex* referable to a second species of the last-named genus. On the first-named of these parasites I proceeded to offer some observations—not, indeed, with the view of seeking to establish the existence of new species by splitting up an old one, but rather for the purpose of showing that the *Distoma clavatum* may be viewed as representing a variety of forms hitherto regarded as separate species by helminthological writers.

Distoma clavatum.—Five examples of a trematode, which I believe to be referable to this species, were found in the stomach. They severally varied in length from four lines to two inches. They were dead, and apparently only very slightly if at all decomposed. They differed somewhat in shape; but all had the so-called head and neck directed backwards. In one example the anterior slender moiety formed a right angle with the body proper, the margin of the ventral acetabulum, viewed from before, being, as it were, placed on a level with the oral sucker. Below the ventral sucker, the two largest specimens were distended with eggs and black pigmentary matter, all of them showing, internally, a dark spot near the centre of the neck. All

of them likewise exhibited more or less well-marked transverse rugæ, extending from the root of the ventral sucker to the lower end of the body. The last ring thus formed surrounded a distinct caudal orifice, representing the outlet of a largely developed contractile vesicle. The eggs presented an average longitudinal diameter of $\frac{1}{500}$ ". Some other points bearing upon the question of specific difference will be incidentally mentioned below.

When recently occupied in revising the collection of Entozoa contained in the Museum of the Royal College of Surgeons, I encountered a considerable variety of parasites without any labels attached, or any mark capable of guiding one as to the source of the specimens. Amongst these were several flukes, which, though differing from each other in respect of size and shape, appeared to be identical species. One of these specimens I afterwards found to be the actual *Distoma clavatum* described and figured by Professor Owen in the Zoological Society's Transactions. Several of the others I have since (by comparing them with specimens deposited in the British Museum) clearly made out to be part of a series contributed by Mr. George Bennett; but the College Museum-stores contained yet a third group of specimens, whose history has hitherto evaded all my endeavours to unravel it. The large individual described by Professor Owen was formerly in the collection of the Rev. Lansdowne Guilding; but we do not know from what fish it was obtained. In Dr. Baird's catalogue, the specimens presented by Mr. Bennett are stated to have come from the stomach of the Bonito; and it is not improbable that Mr. Guilding's specimens, as well as many others whose history is wanting, may be referred to the same "host." Be that as it may, however, the specimens in question not only differ very markedly among themselves, but also, in some respects, from many other forms referable to the same species. I here allude to the various specimens described by systematists, some under one title and some under another. In fact, a species-splitter can point to five or six tolerably distinct forms, which in my view ought to be regarded as specifically identical. To prove this, however, it is necessary to investigate the matter with some care, and to pass in review all the more important notices which have from time to time appeared.

In the year 1730, M. Garsin, a surgeon in the employ of the Dutch East-Indian Company, and Corresponding Member of the French Academy of Sciences, first described this worm, under the generic title of *Hirudinella*. He says:—"Cet insecte tiré de

l'estomac de la Bonite ne vécut qu'environ deux heures. Exposé à l'air il étoit languissant, et reprenoit de la vivacité dans de l'eau de mer. Il diminua sensiblement de volume pendant qu'il vivoit encore"* . M. Garsin's brief description is accompanied by three figures, two of them giving a plan of the possible movements of the head and neck, on the one hand, and of the body on the other, the ventral sucker being the fixed point. His specimens do not appear to have exceeded one inch and a half in length.

In 1774, Pallas described a trematode under the generic and specific names of *Fasciola ventricosa*. It measured two inches in length; but we are left in doubt as to whether it was obtained from any fish. All that he says regarding its source is as follows:—"Ex Amboyna missum fuit singulare hoc molluscum, quod ad aliud quam Fasciolarum genus referre non potui, in quo quasi gigas erit"†. He remarks upon its pale white colour, and notices particularly the soft elastic body proper, which when wounded gave out a dark matter resembling soot. This material, when examined with the microscope, appeared perfectly fresh, and was not the result of decomposition. Pallas also gives many other details respecting the structure of the parasite, accompanied by a figure.

In 1790, Menzies likewise described and figured a fluke about two inches long, which, though differing remarkably from the foregoing in respect of shape, is nevertheless identical. His account of the parasite is recorded in the first volume of the Linnean Society's Transactions, and he calls it *Fasciola clavata*:—"It is of whitish colour, somewhat pellucid, discharging at its mouth a black-coloured fluid which can easily be perceived through its body. I have often found it," he adds, "in the maws of the Boneto, between the tropics in the Pacific Ocean"‡. Notwithstanding the similarity of description, Menzies does not appear to have recognized the identity of his worm with that described by Pallas. Professor Owen, however, subsequently established this identity, and referred to the species as *Fasciola clavata seu ventricosa*§. On the other hand, the British-Museum Catalogue represents Pallas's worm as specifically distinct from that of Menzies, but as identical with the specimen described by Professor Owen from Mr. Guilding's collection.

* Histoire de l'Acad. des Sciences à Paris, 1730, p. 44.

† Spicilegia Zoologica, Fascie. x. (1774) p. 18.

‡ Trans. Linn. Soc. vol. i. (1790) pp. 187, 188.

§ Trans. Zool. Soc. vol. i. (1835) p. 382.

In 1802, Bosc described and figured a trematode under the title of *Fasciola fusca*. This he obtained from the intestines of a Dorado. In form it differs considerably from any of the foregoing species, with all of which, however, it is probably identical. Bosc's description runs as follows:—"Brune, la partie postérieure très-renflée, presque ovale; la partie antérieure mince, cylindrique, inégale, avec deux petits tentacules en dessous. Le suçoir de l'anus très-grand"*. Bosc recognized the identity of his worm with the *Distoma Coryphenæ* of Rudolphi; and systematists generally have adopted his synonymy. In the British-Museum Catalogue the *Fasciola fusca* and *F. ventricosa* of Pallas are regarded as one and the same species. If two small appendages did really exist below the oral sucker, then Bosc's worm is certainly a distinct species. I have never seen anything resembling this amongst the trematode parasites—though the exerted penis might very well be mistaken for one such process. Helminthologists, generally, appear to have doubted the existence of such developments.

In 1827, Nardo obtained two very large flukes from the stomach of a fish captured in the Gulf of Venice during the month of September. He calls the fish *Prostotegus prototypus*, which appears to be the same as the *Luvarus imperialis* of Rafinesque. One of the parasites being no less than five inches in length and nearly half an inch in breadth, he appropriately named the species *Distoma gigas*, believing, naturally enough, that he had to deal with a new species. His description is as follows:—"Distoma teres, rubrum, retractile; poro ventrali minimo cujus apertura magna, rotunda, ciliata; poro antico terminali, parvo; collo brevi, retrorsum divergente, extensili, apice angusto, basi lato; cauda longa, postice incrassata et in apice obtuso osculo donata"†. Here, again, a character is introduced the nature of which it is extremely difficult to understand. I allude to the alleged ciliated condition of the ventral sucker, an appearance perhaps due to a wrinkled state of the lip. Apart from this I see no reason for supposing this parasite to be distinct from the *Distoma clavatum* procured by Mr. Guilding, or the *Fasciola ventricosa* described by Pallas. The intestines of the fish in question harboured another trematode parasite, to which Nardo applied the title *D. Raynerianum*. This appears to be a distinct species; but its size is not stated. Unfortunately, Nardo gives no figure of his *Distoma gigas*. It is by far the largest fluke at present known.

* Hist. Nat. des Vers, vol. i. (1802) p. 271.

† Isis, for 1833, p. 523; from Heisinger's 'Zeitschrift,' 1827, p. 68.

In the year 1835, Professor Owen communicated to the Zoological Society the anatomical memoir to which I have already made reference. In his paper he ably discusses several questions relating to the structure of *Distoma clavatum*, and throws considerable light upon the organization of this species. He quotes the previous writings of Pallas, Rudolphi, and Menzies, and establishes the identity of *Fasciola ventricosa* and *F. clavata*. Although some particulars are wanting respecting the precise mode of termination of the digestive tubes, I think that there can be no doubt as to the propriety of retaining this species amongst the true Distomes. I believe that the large "lateral cavities" described by Professor Owen are neither more nor less than the somewhat unusually distended alimentary cæca. In this particular every helminthologist is familiar with the varieties presented by different species of Trematoda. At all events, there is here no good ground for retaining the generic name *Fasciola*; and still less are we called upon to recognize any of the forms under the title of *Hirudinella*, although Garsin first described the species under this generic title.

In 1845, Dujardin placed the worm with the true Distomes, yet at the same time expressed grave doubts as to whether it were, in any sense, a fluke. "Ce ver," he remarks, "n'est certainement pas un distome ni même un trématode. Si sa forme extérieure et ses deux oscules lui donnent quelque ressemblance avec les distomes, sa structure musculeuse le rapproche davantage des Gordius, et son tégument ressemble à celui des siponcles." M. Dujardin carefully examined the specimens preserved in the Paris Museum; and with regard to one particular example, described as "*Fasciola*, trouvé dans la mer de Nice," he says, it presents "une certaine analogie avec le prétendu *Distoma clavatum*." Manifestly Dujardin himself was somewhat puzzled by the resemblances in question. He does not appear to have had any opportunity of examining fresh specimens; yet he mentions the species as tolerably common in the Bonito, being also occasionally present in the Tunny. At all events it would appear by evidence derived from various sources, that the rightly so-called *Distoma clavatum* is not unfrequently taken from the ocean quite independent of its piscine "bearers."

In reviewing the foregoing notices it is of course open to any naturalist to doubt if they can, one and all, be said to refer to the same species of parasite; yet, notwithstanding divergencies of statements, if any one will take the trouble to examine all the

specimens preserved in this country, I think he will arrive at the conviction which I have expressed at the outset of this paper. It is a comparatively easy task to name afresh every entozoon which happens to come into one's possession; but to ascertain how often it has previously been described may involve a good deal of labour. As an illustration of the truth of the latter remark, I subjoin a list of the synonyms which I believe to belong to the species under consideration:—*Distoma clavatum*, Rudolphi=*D. Coryphænæ*, Rud.=*D. gigas*, Nardo=*Fasciola clavata*, Menzies=*F. Coryphænæ*, Bosc=*F. Coryph. Hippuridis* and *F. Scomбри Pelamidis*, Tilesius=*F. fusca*, Bosc=*Hirudinella marina*, Garsin=*H. clavata*, Baird.

Probably we may here also include Rudolphi's *Distoma tornatum*; but I have never seen the caudal extremity of *D. clavatum* projected to the extent described by Dujardin as occurring in *D. tornatum*, though I think it quite capable of becoming so. Diesing, in my view, gives this accidental invaginating process too much prominence as a specific character when he writes, in regard to *D. tornatum*, "Cauda longissima, gracilimente, moniliformi," overlooking the circumstance that the tail is normally truncated posteriorly. Whether the correctness of my opinions respecting the synonymy of *D. clavatum* be admitted or not, I am confident, as regards certain other reputedly distinct forms of this genus and its allies, that they have had a common origin. On this score I may adduce evidence on some future occasion.

Experiments with *Trichina spiralis*. By T. SPENCER COBBOLD, M.D., F.R.S., F.L.S., Lecturer on Comparative Anatomy at the Middlesex Hospital.

[Read January 17, 1867.]

THE present record may be regarded as a sequel to my paper on 'Experiments with the Cestoid Entozoa' recently submitted to the Society. In conducting these investigations, I have received the friendly cooperation of Professor Simonds, and of Assistant Professor Pritchard, of the Royal Veterinary College.

Exps. 1 and 2. On the 15th March, 1865, an ounce of flesh containing *Trichinæ* was administered to a small black bitch. The dog was destroyed five days subsequently; but neither intestinal nor muscle-trichinæ were discovered. It was thought that the dog had thrown up the bolus, which was strongly saturated with

chloride-of-zinc solution. The bolus consisted of a portion of the *pectoralis major* of a subject brought to the dissecting-room at the Middlesex Hospital. The cysts were highly calcified; but the majority contained living embryos, which were quite unaffected by the zinc-solution injected into the body to prevent decomposition. At the same date a small white puppy was experimented on and examined with precisely the same results. In either case it was, of course, too early to expect muscle-fleshworms to have become developed.

Exp. 3. Half an ounce of the same trichinous human flesh was given (at the same date) to a black-and-tan puppy reared at the Royal Veterinary College, a second "feeding" being administered on the 21st of March, or six days after the first. In this case Mr. Pritchard, who fed the animal, took the precaution to chop the muscle into small pieces and to mix it with other food, in order that the flesh might be the more readily retained in the stomach. The puppy was not destroyed until the 15th of the following June, when, on examination, numerous encysted but non-calcified muscle-trichinæ were found in all the voluntary muscles subjected to microscopic scrutiny.

Exp. 4. An ounce of the same flesh was given to a dark-coloured pig on the 15th of March, and again on the 20th, several other "feedings" being also administered during the month of April (1865). It was destroyed on the 16th of May; but no *Trichinæ* were detected.

Exp. 5. An ounce of the same human muscle-flesh, administered to a small sheep (which was subsequently killed on the 29th of June), produced the same negative results.

Exps. 6 and 7. "Feedings" were at the same time administered to a rat and a mouse. The mouse died on the 2nd April, when I examined its muscles without success. On the following day the rat made its escape, but whether trichinized or not I cannot say.

Exp. 8. An ounce of trichinous human flesh was given to a donkey, in the form of "balls," on the 20th of March; and during the month of June four other separate "feedings" with trichinous dogs' flesh were also administered. In this case the animal was parted with without the result being ascertained.

Exp. 9. From the 15th to the 20th March, 1865, inclusive, three small *Trichina* "feedings" were likewise administered to a guinea-pig. This little animal was not destroyed until the 15th of the following June, when a positive result was obtained. The

pectoralis transversus and other muscles were found to harbour a considerable number of encysted *Trichinæ*.

Exp. 10. On the 20th March, and again on the 21st (1865), "feedings" from the same human subject were administered to a hedgehog. On the 26th of April the animal seemed to be attacked with symptoms of trichinosis. It refused food, kept its head extended and the eyelids closed. On the 27th it appeared much worse, and on the morning of the 28th it was found dead. On the 29th I examined the flesh and found abundance of living *Trichinæ* in the muscles. The capsules were very thin and transparent. A few days later Mr. Simonds also examined the flesh, and confirmed this result.

Exps. 11 and 12. Two chickens were fed, on the 21st of March, with the same material. One of the birds died on the 24th, when I examined the intestines and detected one or two very minute nematodes, which, at the time, I believed to be imperfectly developed *Trichinæ*, but subsequently saw reason to alter my opinion. The other bird died on the 3rd of April, and certainly contained no muscle-trichinæ.

Exp. 13. On the 22nd and 23rd of March "feedings" amounting to an ounce of flesh in all were given to a mole. This animal was returned to the care of Mr. Charles Land, who had previously sent it to the Veterinary College. He subsequently reported that, after observing the mole to be "working" for two or three days, he lost all trace of it, and concluded that it had either escaped or was dead.

Exp. 14. On the 1st and 2nd of May portions of the left fore extremity of the hedgehog (in which we had successfully reared *Trichina* from the Middlesex-Hospital subject) were offered by Mr. Simonds to a cat. The "tabby" ate the flesh very readily, consuming the entire limb. On the 15th of the following June the cat was killed, when living *Trichinæ* were found within all the muscles which we examined.

Exp. 15. At the same dates a young terrier dog was similarly treated, but did not take the "feeding" so readily. In this case the left hind extremity of the hedgehog was employed, and what was not eaten voluntarily was forcibly introduced. On the 1st of June the dog was attacked with "distemper," and died on the 8th of the same month. On examination we found several living *Trichinæ* in the *sterno-maxillaris* and other muscles. Some of the parasites were encysted.

Exp. 16. From the 9th to the 12th of June, inclusive, four sepa-

rate worm feedings with the flesh of the trichinized terrier-dog were administered to a crow. The bird was killed some months afterwards and sent to me for examination. Its muscles were entirely free from *Trichinæ*.

Exp. 17. From the 9th to the 17th of June, inclusive, seven separate worm feedings were administered to a pig. One of the "feedings" was with the trichinized guinea-pig's flesh, the others from the dog. This animal was not destroyed until the 4th of April, 1866, when all the muscles which I examined were found extensively infested with *Trichinæ*. There were probably not less than 16,000,000 present, all being alive and enclosed within perfectly-formed capsules, none of which latter exhibited any traces of calcareous deposition.

Exp. 18. Four separate "feedings" with trichinous dogs' flesh were likewise, at the same dates as the foregoing, administered to a rat. This experimental animal, however, like the one previously mentioned, contrived to make its escape. I fear it was well trichinized.

Exp. 19. About the same date trichinous "feedings" were given to a black puppy (bred at the Veterinary College). The dog was killed on the 18th of August, 1866, having also been made the subject of an echinococcus feeding, when I found abundance of encysted *Trichinæ* within the voluntary muscles.

Exp. 20. Four separate worm feedings with the flesh of the trichinized guinea-pig were given to a sheep on the 15th, 16th, 17th, and 19th days of June, 1865. The experimental animal was destroyed on the 29th of the same month; but the result was negative.

Exps. 21 and 22. "Feedings" with the guinea-pig's flesh—four in the one case and three in the other—were also administered by Mr. Simonds (from the 15th to the 19th of June, inclusive) to a chicken and a goose respectively. These birds were destroyed some months afterwards and sent to me for examination; but the most careful scrutiny failed to detect any *Trichinæ* within their muscles. The goose was cooked and eaten without the slightest hesitation. The chicken I found too tough for consumption.

Exp. 23. On the 28th of March of the present year, I obtained a small quantity of muscle from a highly trichinized German subject, who died, from the effects of an accident, at the London Hospital the day previous. The case is fully reported by Dr. Thudichum in a new journal called 'Scientific Opinion' (No. 4, April 25, 1866, p. 55). During the same day (at 2.30 P.M.) I

fed a dog with part of this human flesh. On the morning of the 31st I killed the dog and examined the intestinal canal (at 11.30 A.M.), which revealed the presence of sexually mature living *Trichinæ*. The males (of one of which I retain an accurate figure) displayed the characteristic bilobed caudal appendages, leaving no doubt as to their source and nature. I have mentioned the precise time of the experiment, in order to show that a period of sixty-nine hours proved amply sufficient for the development of the young muscle-fleshworms of the human subject into the sexually mature adult *Trichinæ* of the dog.

Exp. 24. With another portion of this human flesh (taken from the muscles of the tongue) in which the *Trichinæ* were extraordinarily abundant, I fed a cat. In about ten days the animal showed the most marked symptoms of Trichinosis. It refused to eat; the eye lost its lustre; the body became very thin, and I thought the animal would die. By very great care, keeping it warm before the fire, and subsequently inducing it to take a little milk, the creature improved, gained flesh, and eventually recovered. About three months afterwards I destroyed this cat, when, on examining the *panniculus carnosus*, *latissimus dorsi*, and other superficial muscles, I found great quantities of well-developed, capsuled *Trichinæ*. Although the animal had swallowed scarcely a quarter of an ounce weight of infested flesh, yet thousands of parasites had been propagated in its flesh, and a nearly fatal helminthiasis set up. Dr. Thudichum, who saw the trichinized German subject, estimated the number of parasites in his body at 40,000,000. I do not think this estimate likely to be exaggerated; for if all the flesh had been infested to the extent I found to obtain in respect of the muscles of the tongue, I believe 100,000,000 would have been tolerably near the mark. In places, the point of a needle could not be thrust between the capsules, so closely were they agglomerated.

Exp. 25. From the 19th to the 25th of April, 1866, inclusive, daily administrations of trichinous pork, in the form of bolus, were given to a sheep by Mr. Pritchard. The *Trichinæ* were from one of our experimental animals at the Veterinary College, about two ounces of the flesh being taken at each feeding. The flesh of the sheep (destroyed in the following November) failed to give any indication of the presence of the offspring of these parasites.

Exps. 26 and 27. About the same time, and occasionally at intervals extending over a period of five weeks, Mr. Pritchard also fed two young fowls with the same trichinous pork. Towards the

close of October, 1866, both birds died, when Mr. Pritchard carefully examined the flesh of them, but failed to find any trace of *Trichinæ*.

Exps. 28 and 29. From April 2nd to the 9th of the same month, 1866, inclusive, feedings with trichinous pork were likewise given to two more dogs. These animals were destroyed and examined by Mr. Pritchard in November, 1866; but the result appeared to be negative.

Remarks.—Although, at first sight, these experiments do not, on the whole, appear to have been so successful as one might desire, yet the results obtained correspond very closely with those obtained by investigators on the continent. Thus the seven experiments on birds (including 5 fowls, 1 goose, and 1 crow) were all negative. This experience, so far as muscle-trichinæ are concerned, accords precisely with the results obtained by Profs. H. A. Pagenstecher and C. J. Fuchs at the Zoological Institute in Heidelberg. These experimenters, it is true, found that the ingested muscle-trichinæ acquired sexual maturity within the intestinal canal of their avian "hosts;" but they never found young *Trichinæ* in the muscles of the birds, nor did they perceive any evidences of an attempt on the part of the escaped embryos to effect a wandering or active migration on their own account. Clearly, if the bird's intestinal canal were a proper territory for the residence of sexually mature *Trichinæ*, Drs. Pagenstecher and Fuchs would have found abundance of wandering and non-encapsuled fleshworms, and we should have obtained (owing to the greater length of time which we generally allowed to elapse before destroying the experimental animals) sexually immature muscle-trichinæ enclosed in well formed capsules with, in some instances, more or less calcareous degeneration. I have put the matter thus clearly, because not a few persons still entertain the notion that *Trichinæ* are liable to infest all kinds of warm-blooded, and even, also, many kinds of cold-blooded animals, such as reptiles and fishes. Certain nematodes found in earthworms have been described as *Trichinæ*; and, consequently, pigs and hedgehogs were said to become trichinous through eating these annelids. The minute fleshworms described by Bowman from the muscle of the eel are not true *Trichinæ*, any more than the somewhat similar parasites (*Myoryktes Weismanni*) which Eberth found to infest the muscles of the frog. The negative results above obtained may therefore fairly be taken as positive, in one sense, inasmuch as they help us, with the aid of other experiences, to define the area of

distribution legitimately assignable to *Trichina spiralis* as a good nematode species. Taken in connexion with what we know touching the limitations of distribution or occupation affecting other species of parasites, the facts have a special and very peculiar significance, one, however, upon which I cannot now enlarge. Deducting, therefore, from the 29 experiments the 7 instances, among birds, where the fleshworms would not develop themselves, and also the three separate cases where the experimental animals escaped, together with one other case where no opportunity of examination was afforded, we have left exactly eighteen mammals in which the results were, in all but two, very carefully ascertained. The exceptions were those of the first two dogs experimented on some two years back. The intestinal canal, or rather its mucous contents, were not sufficiently examined to enable me to affirm positively as to the absence of sexually mature *Trichinæ*. In a more recent instance (Exp. No. 23) I had evidence of the difficulty of finding the mature *Trichinæ* in the mucous and half-digested intestinal contents, although the experiment eventually proved perfectly successful. Of course the difficulty of testing the result is a thousandfold increased where only a very small number of *Trichinæ* have been administered. In the sixteen remaining cases the results appeared to have been fully ascertained; and out of these, nine were perfectly successful. The "negatives" comprised three sheep, two dogs, one pig, and a mouse. The "positives" embraced four dogs, two cats, one pig, one guinea-pig, and a hedgehog. At all events, at least one-half of the experiments on mammals yielded positive results, which, considering all the circumstances of the case, is by no means unsatisfactory. Carnivorous mammals, and especially those which subsist on a mixed diet, appear to be most liable to entertain *Trichinæ*; nevertheless it is quite possible to rear fleshworms in herbivora. Pagenstecher and Fuchs succeeded in rearing muscle-trichinæ in a calf; and they found three female intestinal trichinæ in a goat, but, apparently no muscle-fleshworms, although twenty-seven days had elapsed since the first feeding with trichinized rabbit's flesh. In our three sheep no trace of *Trichinæ* could be found. However, on account of the expense, comparatively few experiments have been made on herbivora; and therefore, perhaps, it is as well not to speak too positively from the data already afforded. Not that there is really any practical need for further experiments with this species of parasite; it is quite clear that, in their natural state, herbivorous mammals can seldom have an op-

portunity of infesting themselves, whilst the reverse is the case with swine, carnivorous mammals, and ourselves. Because many quadrupeds may become trichinous, it does not follow that all are liable to be infested. In the case of other parasites (the common fluke, for example) we find them limited to a larger or smaller number of hosts; whilst, on the other hand, in not a few cases, the territory occupied is that of the body of a single species. On this subject I must not now dwell; but I may instance as examples of very limited distribution the two most common cestodes liable to infest the human body. Nematodes, again, display analogous peculiarities of distribution, *Oxyuris vermicularis* being, so far as is at present known, only liable to infest man. Looking at the subject in relation to the public health, I have no hesitation in saying that a great deal of unnecessary fear has been created in this country. No doubt the Imperial authority in Russia has had good grounds for recently issuing an order prohibiting the importation of pork into that country, since severe endemics of Trichiniasis have occurred in neighbouring German states. In this country, however, ordinary precautions will suffice. English swine are almost entirely, if not absolutely, free from this so-called disease; and not a single case of Trichiniasis in the living human subject has been diagnosed in the United Kingdom. Some twenty or thirty cases have been discovered *post mortem*; and it is highly probable that most, if not all, of these individuals had contracted the disease, during life, by eating German pork sausages or other preparations of foreign meat. If further discussion of this aspect of the question were in accordance with the more special aims of the Linnean Society, I would willingly enlarge upon this department of the subject. The mere statement, therefore, of the general practical conclusion at which I have arrived will at least be considered sufficient for the present, and, at the same time, not altogether unsatisfactory.

A Monograph of the Genus *Lemonias*, with Descriptions of New Species in the Collection of the British Museum, including other forms sometimes placed in that Genus. By ARTHUR G. BUTLER, F.Z.S., Assistant in the Zoological Department, British Museum. Communicated by Dr. J. E. Gray, F.R.S., V.P.Z.S.

(With two Plates.)

[Read Nov. 15, 1866.]

My primary object in the present paper is to separate the typical or true species of *Lemonias* from those, of a different form and pattern, which, though allied to that genus, are too distinct both in form and pattern to be retained in it.

The little genus *Tharops*, for instance, can be so readily distinguished, both by form and coloration, from *Lemonias*, that it seems a violation of all order to include them under the same heading; the genus *Anatole*, again, in no way resembles *Lemonias* in coloration, and moreover differs from it entirely in outline.

I have carefully compared the pattern and structure of the different sexes in this group, and by the help of analogy, locality, &c. have been enabled to discover the opposite sexes of several species, of which the males or females alone have hitherto been recognized. I find, moreover, that in several instances two distinct males have been regarded as sexes of one species, whilst at other times two females have shared the same fate.

Genus LEMONIAS.

Lemonias et Calospila, E. Doubleday.

Lemonias (part.), Westwood & Hewitson.

Alæ anticæ maris supra cæruleæ, rufo fuscoque variæ; posticæ fuscæ, marginæ flavo: femineæ fuscæ, anticæ fascia obliqua alba. Anticæ subtus punctis nigro-fuscis iridatis scriptæ.

1. LEMONIAS SUDIAS. (*Lemonias Sudias*, Hewitson, *Exot. Butterf.* ii. p. 115, pl. 58. f. 12, 13, 14 (1858).)

Hab. Honduras.

♂, ♀. B.M.

Alæ maris fuscæ, cæruleo et aliquando albo variæ; femineæ fuscæ, sæpe albo variæ.

2. LEMONIAS ALECTOR. (*Hamanumida Alector*, Hübner, *Zuträge Exot. Schmett.* f. 927, 928 (1806–27). *Lemonias Alector*, Westwood, *Gen. Diurn. Lepid.* p. 458. n. 6 (1851).)

Hab. Brazil.

♀?. Alæ supra fuscae: anticæ fascia subobliqua postmedia alba de costa, coarctata; maculis sex basalibus nigris, albo cinctis; maculis sex submarginalibus iride pallida cinctis: posticæ maculis quinque basalibus, sex septemve mediis in serie arcuata dispositis, septemque marginalibus nigris albo cinctis: corpus fuscum. Alæ subtus pallidiores, aliter velut supra: corpus albidum. Exp. alar. unc. $1\frac{3}{8}$. Pl. VI. fig. 1.

Hab. Tapajos.

B.M.

3. LEMONIAS VIOLACEA, sp. nov. Pl. VI. figs. 2, 3.

♂. Alæ anticæ violaceæ, basi fuscæ; maculis tribus discoideis duabusque internis nigris violaceo cinctis; maculis sex dissimilibus mediis nigris in serie arcuata positis; area externa marginali nigro-fusca, a venis violaceis maculisque sex marginalibus nigris violaceo cinctis interrupta: posticæ albæ, costa violacea maculisque nonnullis basalibus nigris albidis cinctis; punctis sex submarginalibus nigris: corpus fuscum. Anticæ subtus velut supra, fuscae autem pallidioresque: posticæ costa fusca, punctis sex mediis in serie arcuata positis; aliter velut supra: corpus albidis-fuscum. Exp. alar. unc. $1\frac{5}{16}$.

♀. Alæ supra fuscae, anticæ fascia media alba; macularum exemplar velut in *L. Alectore*? ♀, maculis autem mediis magis ad basim approximantibus. Exp. alar. unc. $1\frac{5}{16}$.

Hab. Ega.

♂, ♀. B.M.

4. LEMONIAS HÜBNERI, sp. nov. (*Calospila* Aristus, *E. Doubleday*, *List Lep. Brit. Mus.* pt. ii. p. 15 (1847). *Lemonias* Aristus, *Hewitson*, *Gen. Diurn. Lepid.* pl. 71. f. 12 (1851). *Lemonias leucocyana*, *Westwood*, *ibid.* p. 458. n. 14 (1851).)

♂. Alæ anticæ fuscae, venis apud marginem posticum, lineis duabus submarginalibus, duabusque discalibus apud costam intus angulatis, quarum interna valde irregularis est, violaceis; maculis tribus discoideis duabusque internis violaceo cinctis: posticæ velut eæ speciei præcedentis. Alæ anticæ subtus fuscae, maculis basalibus velut supra nigris albo cinctis; sex septemve mediis similibus in serie obliqua apud costam intus angulata, et sex marginalibus majoribus: posticæ albæ, costa paulo fuscæ, maculis octo basalibus, sex mediis in serie valde irregulari dispositis septemque marginalibus nigris: corpus albidum. Exp. alar. unc. $1\frac{5}{16}$.

♀. Alæ anticæ fuscae, maculis nigrofuscis velut in mari subtus dispositis: posticæ fuscae, margine anali albo; maculis nigris, velut in mari subtus dispositis: corpus fuscum. Alæ subtus pallidiores, maculis nigris albo cinctis: aliter velut supra: corpus ochreo-fuscum. Exp. alar. unc. $1\frac{5}{16}$. Pl. VI. figs. 4, 5.

Hab. Para.

♂, ♀. B.M.

5. LEMONIAS LEUCOCYANA. (*Echenais leucocyana*, *Hübner*, *Zuträge Exot. Schmett.* f. 915, 916 (1806-27).) Pl. VI. figs. 6, 7.

Hab. Para.

♂. B.M.

6. LEMONIAS ARISTUS. (♀. *Papilio Aristus*, *Stoll, Pap. Exot.* pl. 39. f. 4, 4 c (1791). *Erycina Aristus*, *Godart, Enc. Méth.* ix. p. 580. n. 79 (1819). *Lemonias Aristus*, *Westwood, Gen. Diurn. Lepid.* p. 458. n. 14 (1851). *Peplia Ariste*, *Hübner, Verz. bek. Schmett.* p. 20. n. 142 (1816). ♂. *Lemonias Aminias*, *Hewitson, Exot. Butterf.* iii. p. 117, pl. 54. f. 29 (1863).)

Hab. Surinam (*Stoll*), Guiana, Brazil (*Westw.*), Ega. ♂. B.M.

? *Var.* ♀. *Lemonias Balista*, ♂ *Hewitson, ibid.* iii. p. 116, pl. 58. f. 21, 22 (1863).

Hab. Amazon.

The arrangement of the spots in *Aminias* and *Balista* is the same as in *Aristus*.

Alæ anticæ feminae supra fuscae, albido fulvoque variae; posticæ dimidio basali fuscae albido scriptæ, apicali fulvæ. Alæ subtus pallidiores.

7. LEMONIAS ÆMULIUS. (♀ *Hesperia Æmulius*, *Fabricius, Ent. Syst.* iii. pt. 1. p. 322. n. 19 (1793); *Donovan, Ins. India*, pl. 44. f. 2 (1800); *Godart, Enc. Méth.* ix. p. 580. n. 75 (1819). *Lemonias Æmulius*, *Westwood, Gen. Diurn. Lepid.* p. 459. n. 22 (1851). *Calospila?* *Geris, E. Doubleday, List Lep. Brit. Mus.* pt. ii. p. 15 (1847). *Desmozona hemixanthe*, *Felder, Nov. Voy.* (1867).)

Hab. Brazil.

♀. B.M.

This species exactly agrees, in the form of its wings, with *Nymphidium Abaris*, *Cramer*.

8. LEMONIAS BOLENA, sp. nov. Pl. VI. fig. 8.

♀. *Alæ supra ochreæ: anticæ costa basali fusca; area apicali quadrate fusca: posticæ stria interna anali marginali nigro-fusca; apice fusco. Alæ subtus velut supra pallidiores: corpus thorace fusciscente, abdomine ochreo. Exp. alar. unc. $\frac{1\frac{3}{16}}$.*

Hab. Brazil.

B.M.

Anticæ maris basisque posticarum ferrugineæ, area apicali posticarum nivea; alæ subtus fusco pro ferrugineo, anticæ macula anali alteraque minore marginali albidis: anticæ feminae fuscae, apice nigro-fusco, fascia lata media fulva; posticæ fuscae, maculis marginalibus nigris albido cinctis; alæ subtus albidis, anticæ apice maculisque analibus, posticæ marginalibus nigro-fuscis.

9. LEMONIAS PENTHEUS. (♂. *Papilio Pentheus*, *Cramer, Pap. Exot.* ii. pl. 143. f. E. (1779); *Fabricius, Mant. Ins.* ii. p. 82. n. 734 (1787); *Fabr. Ent. Syst.* iii. pt. 1. p. 314. no. 186 (1793). *Erycina Pentheus*, *Godart, Enc. Méth.* ix. p. 580. n. 78 (1819). *Calospila Pentheus*, *E. Doubleday, List Lep. Brit. Mus.* pt. ii. p. 15 (1847). *Lemonias Pentheus*, *Westwood, Gen. Diurn. Lepid.* p. 458. n. 18 (1851). *Anatole Penthea*, *Hübner, Verz. bek. Schmett.* p. 24. n. 188 (1816). ♀. *Lemonias Anseris*, *Hewitson, Exot. Butterf.* iii. p. 115, pl. 58. f. 21 (1863).)

Hab. Guiana, Brazil (*Westw.*), Tapajos, Para.

♂, ♀. B.M.

Alæ feminæ ferruginæ albo variæ.

10. LEMONIAS SENTA. (♂. *Lemonias Senta*, Hewitson, *Exot. Butterf.* i. p. 115, pl. 58. f. 4, 5 (1853).)

Hab. Ega.

♀. B.M.

Alæ maris supra ferruginæ fusco variæ, subtus albidæ punctis nigro-fuscis: feminæ supra fulvæ fusco variæ, aut flavæ, apice anticarum fusco, punctis interrupto; subtus albidæ, anticæ ochreo tinctæ, punctis nigro-fuscis.

11. LEMONIAS CILISSA. (*Lemonias Cilissa*, Hewitson, *Exot. Butterf.* iii. p. 117, pl. 59. f. 33 ♀, 34 ♂ (1863).)

Hab. Nicaragua.

♂, ♀. B.M.

12. LEMONIAS CRISPUS. (♂. *Papilio Crispus*, Cramer, *Pap. Exot.* ii. pl. 118. f. D, E (1779). *Echenais Crispus*, Hübner, *Verz. bek. Schmett.* p. 19. no. 123 (1816). *Lemonias Crispus*, E. Doubleday, *List Lep. Brit. Mus.* ii. p. 16 (1847); *Westwood, Gen. Diurn. Lepid.* p. 459. no. 26 (1851). ♀. *Papilio Emylius*, Cramer, *Pap. Exot.* i. pl. 66. f. G, H. (1779); *Fabricius, Mant. Ins.* ii. p. 78. n. 711. (1787); *Ent. Syst.* iii. pt. 1. p. 305. n. 154 (1793). *Erycina Emylius*, Godart, *Enc. Méth.* ix. p. 577. no. 64 (1819). *Calospila Emylius*, E. Doubleday, *List Lep. Brit. Mus.* pt. 2. p. 15 (1847). *Lemonias Emylius*, *Westwood, Gen. Diurn. Lep.* p. 459. no. 21 (1851).)

Hab. Guiana, Brazil (*Westw.*), Para.

♂, ♀. B.M.

♂. *Var.* (Area basali anticarum supra magis ferrugineo strigosa.)

Hab. Guiana, Antilles, Brazil, Pernambuco (*Westw.*), Ega.

B.M.

This species, although allied to *Lucianus*, is quite distinct from it.

13. LEMONIAS LUCIANUS. (♂. *Hesperia Lucianus*, Fabricius, *Ent. Syst.* iii. pt. 1. p. 313. n. 185 (1793). *Erycina Lucianus*, Godart, *Enc. Méth.* ix. p. 587. n. 113 (1819). *Lemonias Luciana*, Hübner, *Samml. exot. Schmett.* i. pl. 36. f. 1, 2 (1806). *Echenais Luciana*, Hübner, *Verz. bek. Schmett.* p. 19. no. 122 (1816). *Lemonias Crispus* (synonym), *Westwood, Gen. Diurn. Lepid.* p. 459. n. 26 (1851).)

Hab. Tapajos.

♂, ♀. B.M.

The female of this species is very like the female of *Crispus*; it differs in its shorter hind wings, and the differently formed band of the front wings.

14. LEMONIAS PSEUDO-CRISPUS. (♂. *Lemonias pseudo-Crispus*, *Westwood, Gen. Diurn. Lep.* p. 459. n. 27 (1851). *Papilio Crispus*, Cramer, *Pap. Exot.* ii. pl. 118. f. F (1779).) Pl. VI. figs. 9, 10.

♀. (*L. nepiæ* simillima, major autem maculisque minus distinctis.)

Hab. Brazil, Ega.

♂, ♀. B.M.

15. LEMONIAS NEPIA. (♀. *Lemonias nepia*, Hewitson, *Gen. Diurn. Lepid.* pl. 73. f. 2 (1851); *E. Doubleday*, *List Lep. Brit. Mus.* ii. p. 16 (1847); *Westwood*, *Gen. Diurn. Lepid.* p. 459, n. 24 (1851).)
Pl. VI. fig. 11.

Hab. Venezuela.

♂, ♀. B.M.

The male of this species is very like *pseudo-Crispus*, of which it may be only a local form; it is, however, smaller, and with less distinct markings.

16. LEMONIAS NEPIOIDES, sp. nov. (*Pseudo-Crispus*, *local var.*?)

♂ *Lemonias Luciana* ♀, *Hübner*, *Samml. exot. Schmett.* i. pl. 36. f. 3, 4 (1806). Pl. VI. figs. 12, 13.

♀. Alæ supra fuscæ: anticæ macula permagna media flava; punctis nonnullis basalibus nigro-fuscis; punctis sex submarginalibus albidis: posticæ area apicali ferrugineo punctata; punctis septem submarginalibus albis extus nigro marginatis; basi ferrugineo tincta: corpus fuscum. Alæ subtus albidæ, nigro punctatæ: anticæ ochreo tinctæ; limbo posteriore late fuscescente: posticæ macula apicali, duabusque analibus majoribus nigris: corpus albidum. Exp. alar. unc. $1\frac{1}{6}$.

Hab. Tapajos, Para.

♂, ♀. B.M.

The male scarcely differs from *pseudo-Crispus* ♂; the female, however, is smaller and rather differently coloured.

Alæ maris supra ferrugineæ nigro maculatæ, subtus pallidiores; posticæ angulo anali producto: femina supra fulvæ nigro maculatæ, subtus pallidiores.

17. LEMONIAS CEREALIS. (♀. *Lemonias Cerealis*, Hewitson, *Exot. Butterf.* iii. p. 118, pl. 59. f. 37 (1863).)

Hab. Tapajos.

♀. B.M.

Alæ maris supra ferrugineæ, apicibus late nigro-fuscis: anticæ feminae ferrugineæ, area apicali nigro-fusca; posticæ fuscæ ferrugineo variæ: alæ subtus albidæ fusco et ochreo vel flavo variæ.

18. LEMONIAS RHODOPE. (♂. *Lemonias Rhodope*, Hewitson, *Exot. Butterf.* i. p. 116, pl. 58. f. 6, 7 (1853). ♀. *Lemonias Ancile* ♂, *ibid.* iii. p. 117, pl. 59. f. 32.)

Hab. Ega.

♂, ♀. B.M.

19. LEMONIAS BUBO, sp. nov. Pl. VI. figs. 14, 15.

♂. Alæ anticæ velut in *L. Rhodope*, Hew.: posticæ macula subanali geminata albida, aliter velut in *L. Rhodope*. Alæ subtus pallidiores: posticæ breviores, aliter velut in *L. Rhodope*: corpus fusco-albidum. Exp. alar. unc. $1\frac{3}{8}$.

♀. Alæ anticæ velut in *L. Rhodope* ♀: posticæ nigro-fuscæ, punctis duobus apicalibus; maculis tribus mediis ferrugineis, media majore.

Alæ subtus pallidiores, posticæ breviores, aliter velut in *L. Rhodope* ♀ : corpus fusco-albidum. Exp. alar. unc. 1.

Differs from *Rhodope* in having the hind wings shorter, the hind wings of the male above with a large subanal whitish ochreous spot; of the female with three central round spots which take the place of the two interneural internal streaks seen in *Rhodope* ♀.

20. LEMONIAS MISENES. (*Papilio Misenes*, *Cramer*, *Pap. Exot.* ii. pl. 118. f. D (1779). *Erycina Misenes*, *Godart*, *Enc. Méth.* ix. p. 584. n. 96 (1819). *Lemonias Misenes*, *Westwood*, *Gen. Diurn. Lepid.* p. 459. n. 28 (1851). *Echenais Misenessa*, *Hübner*, *Verz. bek. Schmett.* p. 19. n. 119 (1816).)

Hab. Surinam (*Cramer*), Guiana (*Westw.*).

According to Hewitson, this species may be a *Lycæna*, 'Gen. Diurn. Lepid.' Corrections, p. 533. n. 459.

Alæ maris majores, ferrugineæ fusco cæruleoque, vel nigræ ferrugineo cæruleoque variæ: femineæ fuscæ ferrugineo variæ; area apicali posticarum ferruginea: subtus pallidiores, maculis striisque plurimis fuscis.

21. LEMONIAS RHESA.

♂. *Lemonias Rhesa*, *Hewitson*, *Exot. Butterf.* ii. p. 116, pl. 58. f. 15, 16 (1858).

♀. *L. Ancilæ* ♀, *Hewits.*, simillima, major autem anticisque striis pluribus ferrugineis. Pl. VI. fig. 16.

Var. Maris apice anticarum minus nigrescente, maculis subtus aliter dispositis.

Hab. Tapajos (♂ B.M.) · Ega.

♂, ♀. B.M.

22. LEMONIAS ANCILE. (♀. *Lemonias Ancile*, *Hewitson*, *Exot. Butterf.* iii. p. 117, pl. 59. f. 30, 31 (1863), but not ♂ f. 32.)

Hab. Ega.

♀. B.M.

23. LEMONIAS ZEANGER. (*Papilio Zeanger*, *Stoll*, *Pap. Exot.* pl. 37. f. 2, 2 B (1731). *Erycina Zeanger*, *Godart*, *Enc. Méth.* ix. p. 572. n. 36 (1819). *Polystichtis Zeangira*, *Hübner*, *Verz. bek. Schmett.* p. 18. n. 116 (1816).)

Hab. Surinam.

This species is marked in Doubleday's 'Genera' as in the British Museum Collection; we do not, however, possess it, but an allied species from the Amazons; the true *Zeanger* is evidently nearly allied to *L. Rhesa* of Hewitson, from which it principally differs in the marking of the basal portion of the front wings.

24. LEMONIAS CUPREA, sp. nov. (*Lemonias Zeanger*, *Westwood*, *Gen. Diurn. Lepid.* p. 458. n. 17 (1851).) Pl. VI. figs. 17, 18.

♂. Alæ supra flavo-ferrugineæ; apice, margine postico costaque anticarum fuscis: anticæ puncto apicali violaceo, punctis tribus sub-

analibus marginalibus duobusque discalibus apud basin nigris; lineola obliqua subapicali a punctis tribus indistinctis, vel lineola interrupta distincta intus ad venam submedianam continuata, lineolisque tribus æquidistantibus discoideis, nigris: posticæ punctis quinque unoque anali triplici marginalibus nigris; margine interno albicante: corpus flavo-ferrugineum, thorax minime fusciscente. Alæ subtus albidæ cinerascetes, punctis striisque nigris velut in *L. Rhesa* ♂: subtus corpus albidum. Exp. alar. unc. $1\frac{1}{4}$.

Hab. Tapajos, Para.

♂. B.M.

The specimens of this species differ slightly in the arrangement of their markings; indeed the pattern does not appear to be exactly the same in any two individuals.

25. LEMONIAS THARA. (*Lemonias Thara*, Hewitson, *Exot. Butterf.* ii. p. 116, pl. 58. f. 16, 17 (1858).)

Hab. Tapajos.

♂. B.M.

26. LEMONIAS THERMODOË. (♂. *Calospila Thermodoë*, Hübner, *Zuträge Exot. Schmett.* f. 715, 716 (1806–27); *E. Doubleday*, *List Lep. Brit. Mus.* pt. ii. p. 15 (1847). *Lemonias Thermodoë*, Westwood, *Gen. Diurn. Lepid.* p. 458. n. 16 (1851). *Papilio Parthaon*, Dalman, *Anal. Ent.* p. 46 (1823).)

Hab. Ega, Tapajos.

♂. B.M.

♂. *Var.* (Alis majoribus, fascia posticarum ferruginea magis ad apicem producta; maculis striisque subtus aliter dispositis.)

Hab. Brazil.

♂. B.M.

27. LEMONIAS BORSIPPA. (♂. *Lemonias Borsippa*, Hewitson, *Exot. Butterf.* iii. p. 118, pl. 59. f. 35, 36 (1863).)

Hab. Ega.

♂?, ♀. B.M.

28. LEMONIAS BORSIPPINA, sp. nov. Pl. VI. fig. 29.

♀. Alæ supra fuscæ, punctis quatuor ferrugineis: anticæ maculis quatuor apud basim flavo-ferrugineis; fascia discali, punctis quinque post cellam in serie arcuata positis maculisque septem submarginalibus nigro-fuscis: posticæ maculis tribus apud basim flavo-ferrugineis, area anali quadrate flava; punctis tribus subanalibus, uno apicali, maculaque geminata subapicali marginalibus nigris: corpus fuscum. Alæ subtus punctis submarginalibus continuis; posticæ linea discali irregulari nigra: aliter velut in *L. Borsippa* ♀: corpus cinereo-albidum. Exp. alar. unc. $\frac{7}{8}$.

Hab. Tapajos.

B.M.

The following species are supposed to be males of the genus *Aricoris*; I think there can be no doubt that they are so, although at present I retain them at the end of this genus:—

Alæ maris supra cæruleæ, fusco, albo rariusque rufo variæ.

Section I.

Alæ supra cæruleæ; subtus albidæ fusco variæ, venis fuscis.

1. ARICORIS PYTHIA. (Lemonias Pythia, Hewitson, *Exot. Butterf.* i. p. 116, pl. 58.)

Hab. Tapajos.

♂. B.M.

2. ARICORIS AMETHYSTINA, sp. nov. Pl. VII. fig. 7.

Alæ supra fuscæ, purpurascens: anticæ fascia brevi media obliqua alba: corpus fuscum. Alæ subtus eis L. Pythiæ simillimæ: posticæ stria discoidali. Exp. alar. unc. 1½.

Hab. Santarem.

♂. B.M.

This species is closely allied to the preceding one, of which it may be a local form, but differs in outline, the costæ of the hind wings being more direct, the lower portion of the outer margins of the fore wings not convex as in *Pythia*; in colouring it differs as follows:—hind wings above entirely blue, with only a very indistinct violaceous oval spot, and two dots near the anal angle, below with a discoidal streak within the hind-wing-cell.

3. ARICORIS LAGUS. (Papilio Lagus, Cramer, *Pap. Exot.* ii. pl. 117. f. F, G (1779). *Hesperia* Lagus, *Fabricius, Ent. Syst.* iii. pt. 1. p. 306. n. 159 (1793). *Polyommatus* Lagus, *Godart, Enc. Méth.* ix. p. 680. n. 195 (1819). *Theope* Lagus, *E. Doubleday, List Lep. Brit. Mus.* ii. p. 6 (1847). *Pandemos* Lagus, *Westwood, Gen. Diurn. Lepid.* p. 440. n. 2 (1851). *Pandemos* Lagis, *Hübner, Verz. bek. Schmett.* p. 25. n. 193 (1816).) Pl. VII. figs. 2, 4.

Hab. Surinam (*Fabr.*), Ega, Fonteboa.

♂. B.M.

Var. Anticæ macula majore striaque interna apud basim violacea.

Hab. Ega.

♂. B.M.

4. ARICORIS PYTHIOIDES, sp. nov. Pl. VII. fig. 3.

♂. *Alæ supra nigræ cærulescentes, costis nigris: anticæ macula magna discali alba, subhyalina, striaque interna apud basim cærulea albidæ: posticæ striis tribus subanalibus subcæruleis inter venas positæ: corpus fuscum. Alæ subtus velut in A. Lago, Fabr.: corpus albidum. Exp. alar. unc. 1 $\frac{9}{16}$.*

Hab. Ega.

♂. B.M.

Allied to *A. Lagus*, var., but of a different colour, with the markings more distinct, the hind wings of a totally different form, and with discal streaks disposed somewhat as in *A. Pythia* of Hewitson.

Var. *Alæ posticæ supra nigrescentes et immaculatæ.*

Hab. Ega.

B.M.

5. *ARICORIS CYANEA*, sp. nov. Pl. VII. figs. 5, 6.

♂. Alæ supra cyanæ nitidæ, macula valde indistincta anticis albida, apicibus costisque nigris: corpus fuscum. Alæ subtus velut in *A. Lago*, Fabr., posticæ autem basi nec flava: corpus albidum. Exp. alar. unc. $1\frac{6}{8}$.

Hab. Brazil?, Tapajos, Santarem.

B.M.

Closely allied to *A. Lago*, from which it differs in being of a totally different blue colour, with the basal spot very indistinct on the upperside, and the apices and costæ of the wings distinctly black; on the underside it only differs in having no basal orange spot on the hind wings; the hind wings differ in being shorter, but appear to vary slightly in form.

Var. Macula discali anticarum distincta alba geminata. Exp. alar. unc. $1\frac{3}{8}$.

Hab. Brazil?, Para.

♂. B.M.

Section II.

Alæ supra nigro-fusæ, albo cæruleoque variæ, posticæ rufo variæ.

6. *ARICORIS LATONA*. (*Lemonias Latona*, Hewitson, *Exot. Butterf.* i. p. 115, pl. 58. f. 1, 2 (1853).)

Hab. Amazons.

Coll. Bates & Hewitson.

7. *ARICORIS IRENE*. (*Lemonias Irene*, Westwood, *Gen. Diurn. Lepid.* p. 459. n. 29, desc. [foot-note] (1851); Hewitson, *Exot. Butterf.* i. p. 115, pl. 58. f. 3 (1853).) Pl. VII. fig. 8.

Hab. Para (*Westw.*), Ega.

♂. B.M.; ♀. Coll. Bates.

8. *ARICORIS SIAKA*. (*Lemonias Siaka*, Hewitson, *Exot. Butterf.* ii. p. 115, pl. 58. f. 10, 11 (1860).)

Hab. Ega.

♂. B.M.

Section III.

Alæ supra rufæ, subtus flavescentes.

9. *ARICORIS CRUENTATA*. Pl. VII. fig. 15.

♂. Alæ supra coccineæ, margine tenui, nigro; margine interno posticarum flavescente: corpus ochreo-fuscum, thorace rufo tincto, capite fuscrescente, antennis nigris. Alæ subtus flavo-ochraceæ; anticæ costa, apice et margine postico fuscrescentibus, margine ipso nigro; posticæ apice et angulo anali flavescentibus, apice et margine postico nigris: corpus ochreo-albidum, abdomine a latere coccineo, antennis albis nigro fasciolatis. Exp. alar. unc. $1\frac{7}{8}$.

♀. Alæ supra flavescentes, marginibus nigro-fuscis, costa medio interrupta: subtus pallidiores, costa nec fuscrescente, aliter velut in mari coloratæ. Exp. alar. unc. $1\frac{5}{8}$.

Hab. Ega.

♂, ♀. B.M.; Coll. Bates.

Very like some species of *Mesene*, but larger, and with long palpi.

The following species form the genus *Tharops* of Hübner and Doubleday:—

THAROPS, *Hübner*.

Alæ supra cæruleæ viridesce, nigro fusco variae; alæ posticæ marium ad angulum analem productæ.

Section I.

Alæ posticæ maris subtrigonatæ, ad angulum analem paulo productæ, margine postico obliquo.

1. THAROPS MENANDER. (*Papilio Menander*, *Cramer*, *Pap. Exot.* iv. pl. 334. f. C, D ♀ (1782). *Tharops Menander*, *Hübner*, *Verz. bek. Schmett.* p. 109. n. 1179 (1816); *E. Doubleday*, *List Lep. Brit. Mus.* pt. ii. p. 14 (1847); *Hewitson & Westwood*, *Gen. Diurn. Lepid.* pl. 71. f. 11 ♂ (1851). *Lemonias Menander*, *Westwood*, *Gen. Diurn. Lepid.* p. 458. n. 1 (1851). *Erycina Petronius*, *Godart*, *Enc. Méth.* ix. p. 570. n. 29 ♀ (1819).)

Hab. Guiana, Brazil (*Westw.*), Para.

♀. B.M.

2. THAROPS CORUSCANS, sp. nov. Pl. VI. fig. 19.

♀. *Alæ supra cæruleo-virides*: anticae costa apud basin lineaque marginali cæruleis nitidis; area apicali fusca, a fasciis duabus obliquis nigro-fuscis irregularibus, de costa ad nervulum medianum tertium currentibus, interrupta; cella maculas tres nigras includente; area interna a fascia submarginali maculisque septem interrupta, harum tres inter nervulos primum et secundum medianos, quatuorque inter nervulum primum et nervum submedianum positæ sunt: posticæ apice fusco; fasciola interna fasciisque tribus nigro-fuscis continuis, duabus marginalibus, tertiaque discali irregulari angulata: corpus fuscum. *Alæ subtus ochreæ*: anticae margine interno grisescente, apicali fuscescente; punctis fuscis velut in *T. Menandro* positis, basilibus autem plus, et apicalibus minus distinctis; posticæ punctis velut in *T. Menandro*, magis autem separatis et in seriebus magis irregularibus positis; macula permagna apicali, altera anali, duabusque parvis inter eas positis: corpus album minime ochreo tinctum. Exp. alar. unc. $1\frac{5}{8}$.

Hab. Para.

B.M.

We have two specimens of this species in the collection; it is closely allied to *T. Menander*, but larger and with the spots differently arranged, the hind margin of the fore wings more convex, the hind wings proportionally longer and the underside of a distinctly ochreous colour.

3. THAROPS NITIDA, sp. nov. Pl. VI. figs. 20, 21.

♂. Alæ supra cæruleæ, nitidissimæ, certo situ viridescentes, apice anticarum ad cellæ finem nigro-fusco; seriebus duabus macularum nigrarum submarginalibus, externa maculis sex, interna quinque; maculis tribus post cellam unaque ad cellæ finem nigris: posticæ apicē linea marginali fasciolaque apicali nigro-fuscis: corpus fuscum. Alæ subtus albæ: anticæ apice discique medio paulo fusciscentibus: alæ lineis duabus irregularibus discalibus, externa lunulata; linea submarginali valde indistincta simili, lineisque duabus apud basim irregularibus, indistinctis, ochreis: corpus albidum. Exp. alar. unc. $1\frac{9}{16}$.

♀. Alæ supra viridi-cæruleæ, fasciis duabus continuis submarginalibus nigro-fuscis; anticæ fasciis tribus irregularibus de costa currentibus, duabus externis ad marginem internum continuatis sed vix indicatis; posticæ fascia discali irregulari maculata fasciolisque apud basim costalibus nigro-fuscis: corpus fuscum. Exp. alar. unc. $1\frac{5}{8}$.

Hab. Brazil.

B.M.

Both sexes, the female in bad condition: allied to the preceding species.

4. THAROPS HEBRUS. (Papilio Hebrus, *Cramer, Pap. Exot.* pl. 50. f. E, F. (1779); *Fabricius, Mant. Ins.* ii. p. 77. n. 700 (1787); *Ent. Syst.* iii. pt. 1. p. 301. n. 141 (1793). *Erycina Hebrus, Godart, Enc. Méth.* ix. p. 570. n. 30. (1819). *Lemonias Hebrus, Westwood, Gen. Diurn. Lepid.* p. 458. n. 4 (1851). *Peplia Pelidna?*, *Hübner, Verz. bek. Schmett.* p. 20. n. 141 (1816).)

Hab. Guiana, Brazil.

♂. Coll. Salvin; Coll. Bates.

5. THAROPS ION. (*Lemonias Ion, Westwood, Gen. Diurn. Lepid.* p. 458. n. 7, descr. [footnote] (1851).) Pl. VI. figs. 22, 23.

Hab. Brazil (*Westw.*), Para.

♂, ♀. B.M.

6. THAROPS FELSINA. (♀. *Lemonias felsina, Hewitson, Exot. Butterf.* iii. pl., f. 27, 28.)

Hab. Rio de Janeiro.

B.M.

This species was placed by Mr. Doubleday, in his 'List of the Lepidoptera of the British Museum,' in the genus *Cremna*, under the name of *C. Selina*; I think, however, that Mr. Hewitson is right in placing it where he has, as it appears to be allied to *T. Ion*, *Westw.* ♀.

7. THAROPS CICUTA. (*Lemonias Cicuta, Hewitson, Exot. Butterf.* iii. pl., f. 24-26.)

Hab. Para.

♂, ♀. B.M.

Our specimens of this species do not precisely agree with the figures by Mr. Hewitson; the male insect is of a more greenish

hue, and has broader black bands than in his figure; the female also has the spots of the upperside less distinct, and tinged with blue.

Section II.

Alæ posticæ maris ad angulum analem magis productæ, margine postico apud angulum paulo excavato.

8. THAROPS PRETUS. (Papilio Pretus, *Cramer, Pap. Exot.* ii. pl. 182. f. C, D (1779); *Fabricius, Mant. Ins.* ii. p. 36. n. 783 (1787); *Ent. Syst.* iii. pt. 1. p. 333. n. 266 (1793). *Erycina Pretus, Godart, Enc. Méth.* ix. p. 570. n. 28 (1819). *Lemonias Pretus, Westwood, Gen. Diurn. Lepid.* p. 458. n. 3 (1851).)

Hab. Para.

♂. B.M.

9. THAROPS GLAUCOMA. (*Periplacis glaucoma, Hübner, Exot. Schmett. Zuträge*, f. 927, 928 (1806-27). *Lemonias glaucoma, Westwood, Gen. Diurn. Lepid.* p. 458. n. 5 (1851).)

Hab. Brazil.

♂. B.M.

10. THAROPS SPLENDIDA, sp. nov. Pl. VI. figs. 24, 25.

♂. Alæ supra virides, area costali anticarum certo situ violaceo-micante: anticæ margine postico apiceque fuscis; fascia submarginali subintegra, altera discali angulata, fasciola ad cellæ finem, macula cella inclusa maculaque discali interna nigris: posticæ apice fusco, margine interno fusco striam rubram includente; area anali maculis duodecim nigris regulariter positis, una apud basim, tribus infra, quatuor submarginalibus, quatuorque marginalibus: corpus fuscum, viridi variegatum. Alæ subtus albidæ, area costali anticarum externaque posticarum paulo violaceo fuscescentibus: anticæ costa et apice, maculis tribus discoideis, una costali, et sex discalibus parvis lunulatis in serie irregulari arcuata positis, rufo-fuscis: posticæ macula permagna costali, apice, maculaque anali, punctis quatuor marginalibus, sexque submarginalibus lunulatis, lunulis sex parvis discoideis striaque interna in serie irregulari positis, tribus discoideis duabusque indistinctis internis, rufo-fuscis: corpus album, abdomine ochreo tincto. Exp. alar. unc. 2.

♀. Alæ anticæ supra fuscae cæruleo roratæ, apice rufescente, maculis velut in mari nigro-fuscis, seriei discoideæ albo extus marginatis: posticæ area costali cærulea, area anali fusca viridi rorata, angulo anali late rufescente, maculis analibus velut in mari positis, maculis autem submarginalibus et marginalibus ad apicem continuatis: corpus fuscum. Alæ subtus ochreo-albidæ: anticæ maculis tribus discalibus aliisque discoideis vix distinguendis velut supra positis rufo-fuscis, fascia marginali alteraque submarginali indistinctis ochreis: posticæ macula anali magna, una apud apicem, tribus parvis submarginalibus aliisque

velut supra valde indistinctis rufo-fuscis : corpus album. Exp. alar. unc. 2.

Hab. Para.

♂, ♀. B.M.

Closely allied to *T. glaucoma*, but very different, especially on the underside.

11. THAROPS HYALINA, sp. nov. Pl. VI. fig. 26.

♂. Alæ supra hyalinæ, margine interna anticarum maculisque tribus posticis analibus cæruleis ; marginibus late nigro-fuscis : anticæ fascia lata subapicali venisque nigro-fuscis : posticæ venis, excipe ad cellæ finem, nigro-fuscis : margine interno ochreo tincto : corpus fuscum, capite albo punctatum, thorace præ rufo bimaculato. Alæ subtus velut supra : corpus album. Exp. alar. unc. 2.

Hab. Ega.

♂. B.M.

Hab. Para ?

♂, ♀. Coll. Bates.

This beautiful insect is apparently allied to the preceding species ; it does not, however, appear to resemble closely any form yet described.

The following species form the genus *Anatole*, of Hübner and Doubleday :—

Section I.

Alæ maris subtrigonatæ, posticæ elongatæ ad angulum analem rariusque ad marginis externi medium productæ : fuscæ, albo flavoque variæ.

1. ANATOLE ZYGIA. (Lemonias (maculata) Zygia, Hübner, Samml. exot. Schmett. Band i. pl. 35. f. 1, 2 [var. ♂ as ♀ 3, 4] (1806) ; Westwood, Gen. Diurn. Lepid. p. 458. n. 10 (1851). Anatole Zygia, Hübner, Verz. bek. Schmett. p. 24. n. 187 (1816) ; E. Doubleday, List Lep. Brit. Mus. ii. p. 15 (1847).)

Hab. Venezuela, Para.

♂, ♀. B.M.

2. ANATOLE EGAENSIS, sp. nov. Pl. VI. fig. 28.

♀. Alæ minores, supra punctis minoribus albis, aliter velut in *A. Zygia*. Alæ subtus maculis flavis fusciscentibus. Exp. alar. unc. $1\frac{1}{2}$.

♀. Alæ supra nigro-fuscæ, fascia media lata communi alba ; anticæ punctis sex submarginalibus minimis albis ; posticæ maculis septem submarginalibus nigris, tertia albo cincta, aliis indistinctissime extus albido cinctis : corpus nigro-fuscum. Alæ subtus basi posticarum magis fusciscente, fascia lata media velut supra nivea ; aliter velut mari : corpus albidum. Exp. alar. unc. $1\frac{1}{2}$.

Hab. Ega.

♂, ♀. B.M.

The male of this insect is so much like *A. Zygia* that, unless we also possessed the female, it would be impossible to consider it anything more than a local form of that species.

3. ANATOLE EPONE (*A. ZYGIA*, var.?). (*Erycina Epone*, *Godart, Enc. Méth.* ix. p. 580. n. 76 (1819). *Lemonias Epone*, *Westwood, Gen. Diurn. Lepid.* p. 458. n. 11 (1851).)

Hab. Brazil.

♀ ? B.M.

4. ANATOLE CHEA. (*Lemonias Chea*, *Hewitson, Exot. Butterf.* iii. p. 118, pl. 59 (1863).)

Hab. Amazon.

Coll. Saunders & Hewitson.

5. ANATOLE CALIGINEA, sp. nov. Pl. VII. fig. 16.

♂. Alæ supra nigro-fuscæ: anticæ punctis velut in *A. Zygia* albidis: posticæ linea indistincta subbasali albida, ocellis septem marginalibus nigris albido cinctis et ferrugineo circumcinctis: corpus fuscum. Alæ subtus area basali nivea flavo-olivaceo maculata, area apicali olivacea: anticæ fasciola obliqua nivea irregulari post cellam posita; margine postico maculis septem fuscis, intus lunulis niveis marginatis; margine inter venas alternatas niveo: posticæ margine postico late niveo, maculis punctis septem submarginalibus nigris, anali a vena flava medio interrupta; venis apud marginem flavescentibus; ciliis supra et subtus albis fusco variis: corpus subtus olivaceo-fuscum. Exp. alar. unc. $1\frac{1}{2}$.

Hab. Mexico.

♂. B.M.

We have one specimen of this species, in bad condition: it is allied to *A. Zygia*, and looks as if it might be the male of *A. Epone* ♀ ?; but the locality appears to me to be too widely distant to allow of this.

6. ANATOLE ORPHEUS. (*Cremna Orpheus*, *Hewitson, Gen. Diurn. Lepid.* pl. 71. fig. 8; *Westwood*, p. 456. n. 4 (1851); *E. Doubleday, List Lep. Brit. Mus.* pt. ii. p. 14 (1847).)

Hab. Brazil.

♂. B.M.

This species, although it has hitherto been placed in the genus *Cremna*, is evidently closely allied to *A. Zygia* and *A. caliginea*, sp. nov.

7. ANATOLE PULCHERRIMA, sp. nov. Pl. VI. fig. 27.

♂. Alæ anticæ supra rufo-olivaceæ, costa basali et basi ferrugineis, maculis quatuor ovalibus subbasalibus fuscis; fasciola post cellæ extimum obliqua extus irregulari flavo-ferruginea de costa ad nervulum medianum primum pene currente, linea irregulari submarginali ferruginea maculaque subanali flavo-ferruginea; margine interno macula subtriangulari media interrupto: posticæ nivæ, basi fusca, apice fusco ferrugineo interrupto; maculis duabus analibus fuscis ferrugineo interruptis: corpus fuscum. Alæ subtus multo pallidiores, maculis nonnullis basalibus fuscis albido cinctis, aliter velut supra: corpus albido-fuscum. Exp. alar. unc. $1\frac{3}{8}$.

Hab. Nauta (Amazon).

♂. B.M.

Intermediate between *Zygia* and *Albinus*.

8. ANATOLE ALBINUS. (*Lemonias Albinus*, *Felder, Wien. entom. Monatschr.* v. p. 101. n. 67 (1861).)
Hab. Venezuela. ♂, ♀. B.M.

9. ANATOLE GLAPHYRA. (*Anatole Glaphyra*, *Hewitson, Gen. Diurn. Lepid.* pl. 71. fig. 3 (1851). *Lemonias Glaphyra*, *Westwood, ibid.* p. 458. n. 9 (1851).)
Hab. Rio de Janeiro (Brazil). ♂, ♀. B.M.

Section II. APODEMIA, *Feld.*

Alæ maris feminæque simillimæ, fuscæ ferrugineo et albo variæ; velut in generibus Nemeobio vel Melitaca maculatæ.

10. APODEMIA EROSTRATUS. (*Anatole Erostratus*, *Hewitson, Gen. Diurn. Lepid.* pl. 71. f. 4 (1851); *E. Doubleday, List Lep. Brit. Mus.* ii. p. 15 (1847). *Lemonias Erostratus*, *Westwood, Gen. Diurn. Lepid.* p. 458. n. 12 (1851).)
Hab. Venezuela. ♂, ♀. B.M.

11. APODEMIA EPULUS. (*Papilio Epulus*, *Cramer, Pap. Exot.* i. pl. 50. f. C, D (1779); *Fabricius, Mant. Ins.* ii. p. 71. n. 680 (1787); *Ent. Syst.* iii. pt. i. p. 292. n. 117 (1793). *Erycina Epulus*, *Godart, Enc. Méth.* ix. p. 585. n. 99 (1819). *Lemonias Epulus*, *Hübner, Samml. exot. Schmett.* Band i. pl. 38. f. 1-4 (1806); *E. Doubleday, List Lep. Brit. Mus.* pt. ii. p. 16 (1847); *Westwood, Gen. Diurn. Lepid.* p. 459. n. 25. (1851). *Hamearis Epule*, *Hübner, Verz. bek. Schmett.* p. 19. n. 127 (1816).)
Hab. Guiana (*Westw.*), Para, Brazil. ♂, ♀. B.M.

♀ *Var.* *Alæ supra nigro-fuscæ, maculis ferrugineis variæ; anticæ, maculis quatuor mediis albidis a venis interruptis. Alæ subtus obscuriores.*

- Hab.* Brazil. B.M.

Note. This species varies very much in depth of colouring; Brazilian specimens seem to be generally the lightest in hue.

12. APODEMIA MORMO. (*Lemonias Mormo*, *Felder, Wien. entom. Monatschr.* iii., *Lepid. Fragm.* p. 271. n. 19 (1859).)
Hab. Salt Lake (California). Coll. Salvin.

13. APODEMIA AURINIA. (*Lemonias Aurinia*, *Hewitson, Exot. Butterf.* iii. p. 115, pl. 58. f. 19, 20 (1863).)
Hab. Santarem. ♂, ♀. B.M.

14. APODEMIA DOMINA. (♀. *Lemonias domina*, *H. W. Bates, Ent. Month. Mag.* vol. i. p. 204. n. 82 (1864).)
Hab. Panamá. Coll. Salvin.

15. *APODEMIA COLCHIS*, *Felder*. Pl. VII. fig. 17.

♂. Alæ supra fuscæ, serie macularum albarum marginali alteraque submarginali rufescentium: anticæ serie macularum sex septemve albarum arcuata post cellam posita, unaque apud cellæ extimum geminata: posticæ punctis quinque albis discalibus in serie irregulari post cellam positis: corpus fuscum, collo rufescente. Anticæ subtus nigro-fuscæ, costa venis et area postica rufescentibus; maculis albis velut in *A. Epulo* dispositis variæ; duabus analibus punctisque fuscis marginalibus aliisque submarginalibus indistinctis albidis rufescentibus: posticæ olivaceæ, lineis subbasalibus lunulatis fasciisque duabus indistinctis marginalibus ferrugineis: corpus albidum. Exp. alar. unc. $1\frac{7}{8}$.

Hab. Brazil.

♂. B.M.

This species is allied to *Aurinia*, *Domina* and *Epulus*; it has very much the appearance of a female insect; but the hairy prolegs show it to be a male; the abdomen has been broken off.

16. *APODEMIA STALACTIODES*, sp. nov. Pl. VII. fig. 18.

♂. Alæ supra fuscæ, punctis albis maculatæ, fascia submarginali ferruginea; margine nigro, ciliis albo variis: anticæ cella ferruginea: corpus fuscum, abdomine dimidio anali albo. Alæ subtus fuscæ, maculis albidis omnino maculatæ: posticæ macula interna ferruginea: aliter velut supra: corpus albido-fuscum, abdomine rufescente, a latere albo punctatum. Exp. alar. unc. $1\frac{5}{16}$.

Hab. Rio de Janeiro.

♂. B.M.

Allied to the preceding species.

The following species have been placed in the genus *Lemonias*; but I am doubtful whether they really belong to it:—

1. *EMESIS*? *PETRONIUS*. (♂. *Hesperia* Petronius, *Fabricius*, *Ent. Syst.* iii. pt. i. p. 324. n. 227 (1793); *Donovan*, *Ins. Ind.* pl. 43. f. 2 (1800). *Erycina* Petronius, *Godart*, *Enc. Méth.* ix. p. 573. n. 29 (1819). *Lemonias* Petronius, *Westwood*, *Gen. Diurn. Lepid.* p. 458. n. 2 (1851).)

Hab. "In Indiis" (*Fabricius*).

Judging by *Donovan*'s figure, this insect would appear to be a species of *Emesis*.

2. *NYMPHIDIUM*? *KADENII*. (*Lemonias* *Kadenii*, *Felder*, *Wien. ent. Monatschr.* v. p. 101. n. 68 (1861).

Hab. Venezuela.

Lemonias Ptolomæus and *L. agrius* of the 'Genera' form a new genus allied to *Charis*; *Lemonias Meris* is the type of another new genus allied to *Calydna*, for which Mr. Bates has proposed the MS. name of *Lasaia*.

Since writing the present paper, Dr. Felder has published his 'Novara Voyage' containing descriptions and figures of several additional species:—

- LEMONIAS CÆCINA, p. 301. n. 403 } Allied to *Cerealis* of Hewitson, if
 L. MARTIALIS, p. 301. n. 404 } not species of the genus *Charis*.
 L. COLCHIS, ii. tab. 37. f. 5, 6 = sp. of *Apodemia*, p. 302, 'Gen. Nov. Feld.'
 L. ALBINUS, *ibid.* f. 1-4.
 L. SPERTHIAS, *ibid.* f. 9, 10 = *Nymphidium Abaris* ♂ of Fabricius.
 L. KADENII, *ibid.* f. 11, 12 = *Nymphidium*, sp. nov.
 L. CHILENSIS, *ibid.* f. 13, 14 = *Anatole*, sp. nov.
 APODEMIA MORMO, *ibid.* f. 15, 16.
 A. SONORENSIS, p. 303. n. 407. Allied to *Mormo*.
 DESMOZONA HEMIXANTHE, pl. 37. f. 17, 18 = *Lemonias Sosybius*.
 ARICORIS PETAVIA, pl. 38. f. 5, 6 = *Pherephatte*, var.
 A. BABIANA, *ibid.* f. 3, 4 = ? ♀ *Uranus*.

I have not introduced all the species of *Aricoris* into this paper, as several are so different from *Lemonias* in appearance, that they have never been confounded with the species of that genus: I have however represented the opposite sexes of several species in my second plate.

DESCRIPTION OF PLATES.

Plate VI.

- Fig. 1. *Lemonias Alector*, Hüb., ♀.
 2, 3. *L. violacea*, Butl.
 4, 5. *L. Hübneri*, Butl.
 6, 7. *L. leucocyana*, Hüb.
 8. *L. Bolena*, Butl.
 9, 10. *L. pseudo-Crispus*, Westw.
 11. *L. nepia*, Hewits., ♂.
 12, 13. *L. nepioides*, Butl.
 14, 15. *L. Bubo*, Butl.
 16. *L. Rhesa*, Hewits., ♀.
 17, 18. *L. cuprea*, Butl.
 19. *Tharops coruscans*, Butl.
 20, 21. *T. nitida*, Butl.
 22, 23. *T. Ion*, Westw.
 24, 25. *T. splendida*, Butl.
 26. *T. hyalina*, Butl.
 27. *Anatole pulcherrima*, Butl.
 28. *A. egaënsis*, Butl., ♀.
 29. *Lemonias Borsippina*, Butl.
 a. Neuration of *Lemonias*.
 b. Palpus of *Tharops Ion*.
 c. Palpus of *Lemonias Thermodoë*.

Plate VII.

- Fig. 1. *Aricoris inquinata*, Butl.
 (? *Pherephatte*, var.).
 2, 4. *A. Lagus*, Cramer.
 3. *A. pythioides*, Butl.
 5, 6. *A. cyanea*, Butl.
 7. *A. amethystina*, Butl.
 8. *A. Irene*, Westw.
 9, 10. *A. Epitus*, Cramer, var. (Ega).
 11. *A. velutina*, Butl.
 12, 14. *A. Epitus*, Cramer, var. (*Amazons*).
 13. *A. serica*, Westw. & Hewits., ♂.
 15. *A. cruentata*, Butl.
 16. *Anatole caliginea*, Butl.
 17. *Apodemia Colchis*, Feld. var.
 18. *A. stalactioides*, Butl.
 a. Palpus of *Anatole Zygia*.
 b. Palpus of *Apodemia Erostratus*.
 c. Palpus of *Aricoris cyanea*, ♂.
 d. Palpus of *Metacharis regalis*.

New Genera and Species, &c., of Neuropterous Insects; and a revision of Mr. F. Walker's British Museum Catalogue of *Neuroptera*, part ii. (1853), as far as the end of the genus *Myrmeleon*. By ROBERT M'LACHLAN, F.L.S.

[Read March 21, 1867.]

(With one Plate.)

I OFFER this paper as a contribution to a knowledge of the much-neglected Order *Neuroptera*. The insects noticed herein all pertain to that Order in its most perfect sense, all being *Planipennia*, to which division it is probable the term *Neuroptera* should be alone applied. The number of students of these insects being so very limited, and the collected material as yet so small, render any attempt to work out the analogies, in a manner approaching the minuteness effected in the *Coleoptera* and higher forms of *Hymenoptera*, absolutely impossible; and the generic outline recently published by Hagen in his 'Hemerobidarum Synopsis Synonymica,' while of the utmost value as a foundation, shows how little is yet known, and how great are the difficulties of the subject. I have here not attempted any important redistribution or division of existing genera, and the few described as new are for the most part based on newly discovered forms. Nor is this paper at all exhaustive, so far as the materials in my own and other collections are concerned. Many interesting species exist in the collection of the British Museum which time and opportunity have not enabled me to notice, and I believe the Oxford Museum contains as many or more undescribed novelties.

I look upon the revision of Mr. Walker's Catalogue as by far the most important part of the paper. I will not express any opinion on the correctness of the descriptions in the Catalogue, on the principle that a critic is always too ready to find fault with his fellow-workers, and at the same time may be blind to his own shortcomings. Suffice it to say that the chief defect appears not to be inaccuracy of specific description, but a disregard in some instances of the sectional characters, whereby those workers who cannot obtain access to the types are liable to be misled; that specific distinctions are frequently founded on unimportant variations is also to be regretted, but is less serious. Against these objections is to be placed the weighty fact that at the time when the Catalogue was written, now fourteen years since, the subject was in an all but chaotic condition. The examination of the types

of several hundred species has been a work of much labour; and I can scarcely hope that I have escaped errors of commission as well as of omission. I commenced with the intention of revising the whole of part ii. of the Catalogue, but decided upon stopping at the end of the genus *Myrmeleon*. I hope hereafter to write concerning the *Ascalaphidæ*, and reserve that part of the list for the acquirement of fuller information; the *Panorpidæ* were relinquished on account of the difficulties found in separating the North American forms. The evils arising from the retention of large numbers of specific forms under one generic head are exhibited in the *Neuroptera* in an intensified degree. The *Myrmeleonidæ*, for instance, stand greatly in need of more minute division; and the rich genus *Chrysopa* is made of several more or less well-marked groups,—a wide field for the researches of a monographer.

I have before said that an exhaustive work is not here attempted; and if my notes shall smooth the path for future students, their purpose will have been served.

SIALIDÆ.

Genus CHAULIODES, Latreille.

CHAULIODES PUSILLUS, n. sp. Lurido-brunneus. (Antennæ mutilatæ).

Caput subtriangulare, lurido-brunneum; ocellis flavis; oculis nigris; labro magno, antice rotundato. Prothorax duplo longior quam lator, capite angustior, lateribus fere parallelis. Alæ fere æquales, obtusæ, breves, pallide griseo-brunneæ, immaculatæ; venis venulisque brunneis. Pedes brunnei. Abdomen saturate fuscum; appendicibus flavis, superioribus fortiter deorsum incurvatis, parallelis, inferioribus parvis, subdilatis (♂). Long. corp. $6\frac{1}{2}$ ''' ; exp. alar. $1'' 6'''$.

Hab. in India orientali?? In collect. auct.

Antennæ (broken) with the two basal joints brownish testaceous. Head elongate subtriangular; the crown with a median longitudinal impressed line; lurid brown, with some yellowish impressed spaces on the sides posteriorly; labrum large, broader than the clypeus, strongly rounded in front. *Eyes* black. *Ocelli* yellow. *Prothorax* much narrower than the head, twice as long as broad, the sides almost parallel; lurid brown. *Meso-* and *metathorax* lurid brown. *Wings* nearly equal, the posterior only slightly smaller than the anterior; broad, obtuse; pale greyish brown; unspotted, or with an appearance of three small darker spots between the first and second sector; veins and veinlets dark brown; the anterior wings with about seventeen transverse veins in the costal area, which become closer and oblique towards the apex; transverse discal veins very few. *Legs* lurid brown, the tarsi more obscure. *Abdomen* dark fuscous, almost black beneath;

appendices yellow; the superior curved strongly under and parallel; the inferior short, somewhat dilated, appearing to arise from the bases of the superior, and directed outwards.

I possess one male of this small species, but with no record of locality. It is possibly Indian.

CHAULIODES JAPONICUS, n.sp. Fuscus. (Antennæ mutilatæ). Caput pallide flavidum, supra infra et utrinque medio nigrum; mandibulæ piceo-fuscae. Prothorax capite vix angustior, paullo longior quam lator, fere parallelus, supra convexus, postice medio linea impressus; fuscus, infra flavidus. Alæ elongatæ, latæ, pallide cinereo-hyalinæ, apicibus vix acuminatis: anticæ inconspicue fusco nebulosæ; pterostigmate elongato, fusco; venulis costalibus venisque longitudinalibus fusco-nigris; venulis transversalibus discalibus paucis, pallidis: posticæ anticis vix pallidiores. Pedes pallide fusci, subtus flavi; genibus, tibiarum apicibus tarsisque saturate fuscis. Abdomen fusco-nigrum (♀). Long. corp. 1" 4''; exp. alar. 4" 2''.

Hab. in Japonia. In collect. auct.

Brown. (Antennæ broken in my example). *Head* pale yellowish, shining, the middle above occupied by a quadrate blackish space, which is interrupted by a yellowish line margining a median longitudinal impressed line, the sides narrowly black; beneath, the middle is shining blackish; the space before the mandibles, and these latter, pitchy fuscous; *ocelli* yellow; *eyes* dark shining fuscous. *Prothorax* brown above, yellow beneath; narrower than the head, rather longer than broad, the sides nearly parallel, the anterior margin rounded; upper surface very convex posteriorly, with a lanceolate median impressed space, and with irregular impressed spaces at the sides. *Meso- and metathorax* pale fuscous. *Wings* long, broad, the apices somewhat narrowed, and the apical margin slightly excised; cinereo-subhyaline: *anterior wings* with indistinct fuscous clouds, pterostigmatal region fuscous; costal veinlets numerous, blackish fuscous; longitudinal veins blackish fuscous; the discal and apical transverse veinlets very few and fine, pale: *posterior wings* slightly paler, less clouded, excepting at the apex; veins and veinlets coloured as in the anterior. *Legs* pale fuscous above, yellow beneath; the knees, the apical portion of the tibiæ, and the tarsi wholly dark fuscous. *Abdomen* blackish.

There is another Japanese species, *C. grandis* (*Hemerobius grandis*), Thunberg, which, as far as I am aware, is known only from Thunberg's description and coarse figure; it is very different from *C. japonicus*.

Genus *CORYDALIS*, Latreille.

CORYDALIS BATESII, n. sp. (Plate VIII. fig. 1). Brunnea. Antennæ graciles, simplices, flavæ nigro terminatæ. Caput supra et infra intense

piceo-brunneum, dense et minute punctatum; mandibularum apicibus palpisque nigris. Prothorax longior quam lator, supra convexus, fere parallelus, postice ter impressus, luride brunneus. Mesothorax metathoraxque prothoracem latitudine subæquantes. Alæ elongatæ: anticæ cinereæ, pone medium fuliginosæ; nebulis magnis plurimis apud radium, in spatio subcostali margineque costali fusco-nigris; punctis in cellulis albis; venulis costalibus plerumque, transversalibus omnino nigris, nonnullis basin versus crassis; venis longitudinalibus plerumque testaceis: posticæ anticis paullo latiores; venulis transversalibus nigris. Pedes fusci; tarsi tibiæque apicibus (præcipue posteriorum) flavidis (♀). Long. corp. 2" 3"; exp. alar. 5" 2".

Hab. Ega, Brazil. In collect. auct.

Brown. *Antennæ* very slender, not toothed, not more than two-thirds the length of the body, yellow, the tips black. *Head* above and beneath dark pitchy brown, finely and closely punctured, the tooth at the lower angles, acute; margined with yellow at the insertions of the mandibles; *ocelli* yellow; *eyes* dark olivaceous; *mandibles* (♀) scarcely so long as the head, black at the tips, with three closely placed teeth beneath the apex internally; *palpi* black. *Prothorax* longer than broad, scarcely dilated posteriorly, the sides nearly parallel, very convex above, smooth, dull brown, with three short impressed spaces behind. *Meso-* and *metathorax* small, scarcely broader than the prothorax, each broader than long, pale brown. *Wings* very long, somewhat acute, narrow: *anterior wings* cinereous, a large space beyond the middle clouded with pale smoky fuscous; numerous large blackish blotches in the anterior portion, one at the pterostigmatal region, several in the subcostal area, and others under the radius; small white dots in the cellules; costal veinlets all simple except about two, very strong, each veinlet mostly black at each end and testaceous in the middle, but all black beyond the middle of the costa; transverse and gradate veinlets of the disk black, some of those towards the base much incrassated; longitudinal veins, excepting where they traverse the dark blotches, testaceous: *posterior wings* slightly broader than the anterior, paler; some smoky clouds on the anterior margin; costal and all transverse veinlets black. *Legs* fuscous, paler beneath; all the tarsi and the apical portion of the tibiæ (especially the posterior) yellowish ochreous; finely pilose. *Abdomen* fuscous (the colours probably altered).

For this magnificent insect I am indebted to my friend Mr. H. W. Bates. It was the only *Corydalid* he saw during eleven years' residence on the Amazons.

CORYDALIS CRASSICORNIS, n. sp. (Plate VIII. fig. 2). Pallide brunnea.

Antennæ testaceo-fuscae, nigro terminatæ, corpori fere æquales, valde robustæ; articulo basali fortiter inflato; articulis reliquis (basin versus exceptis) subtus singulatim dente recto brevi instructis. Caput latis-

simum, rugulosum, testaceo-fuscum, circum ocellos marginemque anteriorem nigrum; mandibulis valde elongatis, concoloribus, præter apices obscuriores; palpis nigris; ocellis flavis. Prothorax brevis, fere quadratus, supra planiusculus; testaceo-fuscus, flavo maculatus, postice impressus, rugosus. Mesothorax metathoraxque prothorace vix angustiores, castaneo-fusci. Alæ cinereo-hyalinæ: anticæ punctis plurimis albis; areacostali pallidiore, apicem versus infuscata; area subcostali fere omnino infuscata; venulis costalibus albidis, nigro terminatis, apicem versus omnino nigris; venulis transversalibus nigris; venis longitudinalibus testaceis: posticæ vix pallidiores; venulis costalibus nonnullisque transversalibus nigris, reliquis testaceis. Pedes flavido-brunnei, tarsis genibusque intense fuscis. Abdomen flavidum; appendicibus elongatis pilosiusculis; superioribus apicibus approximatis, dilatatis, abrupte deorsum inflectis; inferioribus dimidio et ultra brevioribus, cylindricis, sursum incurvatis (♂). Long. corp. sine mandib. et append. 1" 10"; long. mandib. 1" 8"; exp. alar. 5" 4".

Hab. Texas. In collect. auct.

Pale brownish testaceous. *Antennæ* as long as, or longer than, the body, very thick, brown, the sutures of the joints, and the 3 or 4 terminal joints, black; basal joints very greatly inflated, bulbous; each of the other joints, excepting those in the basal fourth, furnished beneath with a short straight triangular tooth; towards the base a commencement of this structure is seen in the presence of a tubercle only. *Head* very broad, the tooth at the posterior angles acute; above flattened, finely rugose, posteriorly with three impressed coarsely reticulated spaces; deep cavities in front before the base of each antenna; colour pale brownish testaceous, blackish round the ocelli, and narrowly margined with blackish in front; palpi black; ocelli yellow; eyes brown; mandibles very long, almost equalling the body, sulcated at the base above, rugose, the roughness occasioned by numerous closely placed transverse series of minute tubercles, the inner edge with small blackish tubercles, colour the same as the head, but darker at the tips. *Prothorax* nearly quadrate, scarcely longer than broad, hardly perceptibly dilated behind; brownish-testaceous, the anterior margin narrowly blackish; surface uneven, a lanceolate median longitudinal impression behind, and several raised spaces on each side, which are rather paler than the ground-colour. *Meso- and metathorax* nearly equal, slightly narrower than the hinder edge of the prothorax, brown. *Wings* elongate, cinereo-hyaline: *anterior wings* with numerous small white dots in the cellules; the pterostigmatal region dark fuscous; the subcostal area dark fuscous, with paler spaces; the first 3 or 4 costal veinlets and those towards the apex altogether blackish, the rest yellowish white, black at each end; all the transverse discal veinlets black; longitudinal veins testaceous: *posterior wings* scarcely paler than the anterior; the subcostal area infuscated; costal veinlets, and some of the discal, black. *Legs* pale brown, the tarsi, knees,

and apical half of tibiæ dark fuscous. *Abdomen* yellowish; appendices very long, slightly pilose; superior nearly cylindrical, dilated at the base, the tips approximating, dilated and truncated, but suddenly bent downwards and produced into a short process; inferior not half so long as the superior, cylindrical, curved upwards at the tips.

CORYDALIS INAMABILIS, n.sp. (Plate VIII. fig. 3). *Brunnea*. *Antennæ* corpore paulo breviores, modice incrassatæ, pallide fuscæ, nigro terminatæ; articulo basali inflato; reliquis, basalibus exceptis, singulatim subtus dente recto acuto instructis. *Caput* luteo-fuscum, antice pallidius, rugulosum; ocelli flavi; oculi plumbacei; palpi nigri flavo annulati; mandibulæ valde elongatæ, intense fuscæ, basi pallidiores. *Prothorax* longior quam lator, supra convexus, postice leviter lator; brunneus. *Mesothorax* metathoraxque prothorace latiores. *Alæ* elongatæ, angustæ, cinereo-hyalinæ: anticæ punctis numerosis albis; area subcostali fusco-nebulosa; venulis costalibus nigris, basin versus pallido interruptis; venulis transversalibus nigris; venis longitudinalibus flavidis: posticæ concolores; venulis costalibus nonnullisque discalibus nigris. *Pedes* pallide brunnei, tarsis tibiarum apicibusque obscurioribus. *Abdomen* fuscum; appendicibus elongatis; superioribus biarticulatis, articulo ultimo sinuato, apice deorsum incurvato; inferioribus brevioribus, geniculatis, apicibus subclavatis (♂). *Long. corp.* sine mandib. et append. 1" 4"; *long. mandib.* 1"; *exp. alar.* 4".

Hab. Texas. In collect. auct.

Pale brown. *Antennæ* scarcely shorter than the body, moderately thick, pale brown, the three or four terminal joints black; basal joint stout and bulbous; the succeeding joints, excepting those in the basal fourth, each provided near its extremity beneath with a short straight triangular acute tooth. *Head* yellowish brown, the anterior margin narrowly black; finely roughened above and beneath, and posteriorly with coarsely reticulated spaces; *ocelli* yellow; *eyes* plumbaceous; *palpi* black, with broad whitish yellow annulations. *Mandibles* very long, slender, finely rugose, pale brown, the apical portion dark. *Prothorax* longer than broad, sensibly widened posteriorly; the upper surface convex, with a lanceolate median longitudinal impression behind, and roughened raised spaces along the sides, colour pale brown. *Meso- and metathorax* slightly broader than the prothorax, nearly equal. *Wings* long and narrow, subacute, cinereo-subhyaline: *anterior wings* with numerous small white dots everywhere in the cellules, excepting in the costal area; subcostal area with fuscous spaces; pterostigmatal region slightly yellowish; costal veinlets black, those near the middle whitish in the centre; all the discal and apical transverse veinlets black; the longitudinal veins yellow, the subcostal and radius interrupted with fuscous: *posterior wings* scarcely paler than the anterior; costal veinlets and most of the discal and apical transverse veinlets black; the longitudinal veins,

and the discal transverse veinlets towards the base, yellow. *Legs* pale yellowish brown, the tarsi and tips of the tibiae more obscure. *Abdomen* pale fuscous; appendices long, yellowish, slightly pilose; superior appendices sinuated, bisarticulate, the tips bent under; inferior appendices geniculated, the apices directed upwards and slightly dilated.

This species is closely allied to *C. crassicornis*, and has the same antennal structure; it differs in its apparently smaller size, *annulated palpi*, and a slightly different formation of the appendices.

In the genus *Corydalidæ* the character of *size*, when taken from a single individual of a species, is not of much importance, as these insects vary greatly in this respect, not only sexually, but also in different examples of the same sex.

MYRMELEONIDÆ.

Genus PALPARES, Rambur.

PALPARES FALCATUS, n. sp. Rufo-fulvus. Antennæ rufescentes. Caput rufo-fulvum; occipite postice maculis tribus, antice vitta transversa quadrimaculata, maculis nigris. Palpi nitentes, piceo-brunnei. Thorax vitta media, et utrinque, fuscus. Alæ latæ, albido-hyalinæ: anticæ ad apicem obtusæ, dente parvo instructæ, puncto ad marginem dorsalem prope basin nigro-fusco; maculis costalibus numerosis, obliquis, alteris ad apicem, duabus magnis plus minusve confluentibus basin versus, fasciis duabus transversis, obliquis, quarum una angusta, ante medium, altera lata pone medium, nebulaque magna apicali, fuscis: posticæ apicibus sursum productis, valde falcatis, margine sinuato; maculis nonnullis costalibus et ante apicem fasciisque tribus latis, quarum una media fere interrupta ad marginem dorsalem apicem versus producta, altera completa pone medium, tertia ad apicem, fuscis: venis venulisque rufescentibus. Pedes rufo-fusci, albido pilosi, nigro spinosi. Abdomen fuscum, vix rufescens; ♂ appendicibus brevibus, curvatis, fere clavatis, intus spinis brevibus nigris dense instructis. Long. corp. 2"; exp. alar. 5" 3".

Hab. Birmah. In collect. Mus. Brit. (♂) et auct. (♀).

Antennæ reddish. *Head* pale reddish-fulvous, darker about the basal joints of the antennæ; front yellowish; occiput in front with a transverse vitta composed of four black spots, the two middle ones somewhat united, behind or above with three black spots placed in a triangle, and a short line on each side of the upper ones. *Thorax* reddish fulvous, a median narrow fuscous stripe, and the sides broadly fuscous; prothorax narrowly transverse, and, with the mesothorax, clothed with reddish hairs; metathorax clothed more thickly with whitish hairs; the breast reddish brown. *Wings* much dilated beyond the middle, hyaline: *anterior wings* obtuse at the end, but the ex-

treme apex produced into a sort of tooth; the apical margin and apical half of dorsal sinuated; on the dorsal margin near the base is a small black shining spot; costal margin with numerous oblique fuscous spots, a collection of fuscous spots on the costa beyond the pterostigma; a fuscous line at the postcostal furcation; two large, more or less confluent, fuscous spots in the upper part of the disk towards the base; a narrow oblique fuscous fascia before the middle, broadest at its commencement below the radius, and becoming gradually narrower until its junction with the dorsal margin; a broad oblique fascia beyond the middle, becoming paler and cloudy on the dorsal margin, so that it appears as a very large blotch extending from below the apex two-thirds across the wing, after which it is indistinct; a pale fuscous cloudy space before the apex, below the collection of subapical costal spots; the tooth-like apical production fuscous; besides these markings some of the principal veins are dotted with fuscous, and smaller dots in the pterostigmatal region: *posterior wings* slightly shorter and narrower than the anterior; the apex produced upwards and ending in a strongly curved hook, the margins sinuated as in the anterior; the oblique costal spots are less numerous and do not extend beyond the middle of the costa; a collection of spots at the commencement of the elevated apex, beyond the pterostigma; a mark at the postcostal furcation; three broad transverse fasciæ, one about the middle commencing below the radius, and almost interrupted in the middle, produced towards the apex on the dorsal margin; the second beyond the middle, commencing on the costal margin, the edges sinuated; the third occupying the apex, dilated in the middle, so that it is almost triangular in form: in all the wings the pterostigmatal region is somewhat opaque, and dirty whitish; all the veins and veinlets reddish, becoming darker where they traverse the fuscous markings. *Legs* dark pitchy brown or reddish brown, short and stout, rather thickly clothed with short whitish hairs and strong blackish spines. *Abdomen* reddish brown, darker at the base, which portion is clothed with fine whitish pubescence; ♂, appendices short, not half the length of the penultimate segment, curved, the apices thickened, hairy, the inner side thickly set with short black spines.

This insect is most allied to *P. contrarius*, Walker, but very distinct, especially through the strongly falcate posterior wings. With that species, and with *P. gigas*, Dalman, and *P. mæstus*, Hagen, it forms a peculiar group which no doubt will eventually be generically separated, and to which the term *Symmathetes* may be applied. The male above described is the only one known in the four species.

PALPARES FULVUS, n. sp. Rufo-brunneus. Antennæ nigræ; clava acuminata. Caput rufo-griseum; vertice valde fornicato, vitta media nigra; fronte flava; palpis nigris, gracilibus, labialibus perelongatis.

Thorax supra rufo-fulvus, sparse nigro pilosus, vitta media nigra (metathorax albido pilosus); infra (et supra utrinque) intense niger. Alæ latæ, apicibus acutiusculis: anticæ fulvæ, subhyalinæ, margine apicali late brunneo; punctis costalibus dorsalibusque (ad basin), nonnullisque discalibus pone medium, nigris; maculis duabus magnis basin versus, fascia interrupta ante medium, macula costali permagna pone medium, fasciaque apicali nigris; venis venulisque testaceis, in maculis nigris: posticæ albæ, maculis duabus oppositis basalibus, macula costali ante apicem fasciisque duabus, latissimis, quarum una ante medium, altera pone medium cum prima vix confluyente, circum marginem apicalem extensa, nigris. Pedes intense nigri. Abdomen rufo-brunneum. ♀. Long. corp. 2" 4"; exp. alar. 5" 8".

Hab. in Africa australi?. In collect. auct.

Antennæ nearly as long as the thorax, the club attenuated, black. *Head* greyish; the vertex strongly inflated, with a deep longitudinal impressed line, a black median vitta expanding in front in form of an Y, and with a small black dot on each side; face yellow, somewhat reddish round the eyes; *palpi* black, the labial very long and slender, the terminal joint abruptly clavate and somewhat piceous at the extreme apex. *Eyes* dark grey, with darker streaks. *Thorax* reddish fulvous, above with a median black vitta, the sides and the under surface intensely black; *prothorax* rather broader than long, dilated posteriorly, clothed sparingly with black hairs; *metathorax* clothed sparingly above and densely at the sides beneath with long white pubescence. *Wings* broad, acute at the apex, the apical margin slightly sinuated: *anterior wings* pale fulvous, subhyaline, the apical margin broadly margined with brown; the costal area with black spots only on the margin at the base, afterwards also with several larger oblique ones; the median vein at the base, and the base of the dorsal margin, with deep black spots; and there are numerous small blackish dots towards the apex and on the disk; a large black blotch near the base below the radius, a smaller one at the postcostal furcation on the dorsal margin; before the middle a very large black blotch below the radius, more or less connected with a dorsal one and forming a somewhat interrupted fascia; beyond the middle a still larger black blotch extended to the costal margin and reaching more than half across the wing; a clouded blackish fascia formed of two connected spots just before the apex; costal vein black, the other veins and veinlets reddish testaceous, but black where they traverse the black markings: *posterior wings* white, pinkish towards the apex; a few black spots on the basal portion of the dorsal margin; a large black blotch near the base, opposite to a smaller one at the postcostal furcation on the dorsal margin; a broad black fascia before the middle much dilated on the dorsal margin; another broad black fascia beyond the middle, with a furcation more or less confluent with the first fascia, and an extension round the apical margin; a large black spot on the

costa just before the extreme apex; these black markings occupy more of the wing than does the white ground-colour; veins testaceous in the white portion, black in the black. *Legs* short and very stout, deep black. *Abdomen* reddish brown, more obscure in the apical half; the two basal segments show a trace of the black dorsal thoracic vitta; the basal segments with short white pubescence.

I have one female example of this grand insect, but without any indication of locality; it is possibly African.

PALPARES IMMENSUS, n. sp. Testaceous, albo hirsutus. *Antennæ* nigrae. *Caput* prothoraxque flava, vitta media nigra; palpi nigri. *Mesothorax* metathoraxque densissime albo hirsuti. *Alæ* anticae elongatae, angustae, acutae, hyalinae, ad costam basinque nigro reticulatae; maculis discalibus vittisque duabus, quarum una obliqua ante medium marginem dorsalem versus, altera in apice, nigro-fuliginosis, pallido reticulatis, striga elongata attenuata ante marginem dorsalem nigro-fuliginosa: posticae anticis paulo breviores, hyalinae; fasciis duabus, quarum una valde irregularis in dimidio basali, altera, interdum interrupta, pone medium, strigis duabus apicalibus strigae interrupta ante marginem dorsalem nigris. *Pedes* nigri; tarsorum articulo ultimo unguibusque brunneo-testaceis. *Abdomen* rufo-testaceum, apice nigro; ♂ appendicibus nigris, sursum incurvatis. (♂ ♀.) Long. corp. 2"-2" 6''; exp. alar. 5" 6''-6''.

Hab. "Damara Land" (*Andersson*). In collect. auct.

Antennæ about the length of the mesothorax, black. *Head* yellow, the vertex strongly inflated and somewhat reddish anteriorly; a deep median impressed longitudinal line; face bright yellow, with a shining black line on each side; palpi shining black, the articulation between the penultimate and terminal joints yellowish. A broad black median longitudinal line extends along the vertex, prothorax, and anterior portion of the mesothorax. - *Prothorax* very narrow, thrice as broad as long, yellow; divided into three transverse divisions by means of the impressed lines. *Meso- and metathorax* densely clothed with long white pubescence both above and beneath, yellowish; the metathorax with two conspicuous testaceous spots. *Anterior wings* very long, narrow, acute, hyaline; the costal margin very straight; pterostigma yellowish; costal space with numerous transverse black lines; the basal fourth of the wings strongly reticulated with black; on the disk are several blackish spots with pale reticulations, viz. one near the base, another before the middle, and two opposite ones beyond the middle; an oblique blackish streak near the middle of the dorsal margin and a straight one on the apex; a long blackish line extending from near the apex to beyond the middle of the dorsal margin, placed very near the margin, but leaving a hyaline space between it and the extreme edge; a number of small black spots between the pterostigma and the apex; costal vein, sub-

costa, and radius black, the rest of the veins and veinlets yellowish. *Posterior wings* similar in form to the anterior, and scarcely perceptibly shorter, hyaline; costal transverse black spots less in number; the basal half of the wing with a very irregular broad angulated black fascia with a long irregular prolongation almost reaching the base; beyond this is another fascia composed of two large more or less united black spots, whereof the lower one is very much the larger; two lines and some black points in the apex; a line before the dorsal margin, which is not complete but more or less broken up into spots; colouring of the veins as in the anterior wings; the knobbed appendage at the base testaceous. *Legs* black, with strong black spines and white hairs intermingled; tarsi brown; tibial spurs as long as the two first tarsal joints, slightly curved; claws nearly as long as the last tarsal joint. *Abdomen* not nearly so long as the wings, stout in the female, reddish testaceous, the apex and segmental divisions blackish, clothed with fine white pubescence; in the male the appendices are short, black, nearly cylindrical, the tips flattened, curved strongly downwards, with the tips directed upwards, forming almost a semicircle.

I possess three examples (1 ♂, 2 ♀) of this enormous insect from Damara Land.

PALPARES SPAREUS, n. sp. Flavius. Antennae nigrae. Caput flavum, nigro univittatum. Thorax dense albido hirsutus, flavus, nigro-trivittatus; pectus flavo nigroque ornatum. Alae ad apicem dilatatae, subobtusae, albido-hyalinae, punctis parvis vix regulariter nigro conspersae; margine costali punctis majoribus; pterostigmate et (♂) spatio subcostali pallide flavis; venis venulisque flavis: posticae (♀) macula tribus reticulatis nigris. Pedes flavi; tarsi nigris. Abdomen flavum, utrinque et infra late nigrum; ♂ appendicibus cylindricis regulariter curvatis, flavis. ♂ ♀. Long. corp. 2'; exp. alar. 3' 11"–4' 7".

Hab. "Damara Land" et Zambesi. In collect. auct.

Pale yellow. *Antennae* black, nearly the length of the thorax. Head pale yellow; the vertex above with a median broad black line expanding about the base of the antennae; face yellow, with a quadrate black spot; *pelpi* blackish, yellow at the articulations; eyes leaden black. *Prothorax* very short, much broader than long, with a deep transverse channel in the middle, the margins on either side of which are strongly elevated. The whole of the *pro-*, *meso-*, and *metathorax* is clothed above and beneath with fine long whitish pubescence; pale yellow, above with three broad longitudinal black vittae; beneath black, with large yellow spots. *Wings* much dilated beyond the middle, subobtusae; pale whitish, hyaline, the broad apical marginal region more opaque; pterostigma, the attachments at the base, and the subcostal area pale yellow; costal margin with rather large subquadrate black spots; the whole of the rest of the wing pretty regularly sprinkled with small black spots, which are less numerous on the posterior wings; veins

and veinlets pale yellow, excepting those placed in the black spots, where they are blackish. *Legs* orange yellow, the tips of the tibiae and the whole of the tarsi shining black; spines black; spurs and claws pitchy. *Abdomen* pale yellow, with whitish hairs at the base, and afterwards with minute black bristles; a broad band on each side and the under surface black; terminal segment wholly yellow; appendices cylindrical, regularly curved, yellow.

The above description applies to a male taken by Mr. T. Baines on the Daka River in the Zambesi valley in March.

The female from Damara Land differs in wanting the yellow tint on the subcostal area; the small dots on the posterior wings are less numerous, and in these wings are three rather large blackish reticulated spots, one on the disk about the middle, and two others placed obliquely a little within the pterostigma, the larger of which is near the costal margin; the reticulation is paler, almost colourless (excepting in the black markings). The tibiae have a vestige of a black mark externally.

As I have seen but one example from each locality, respectively male and female, I am unable to say if the small differences above noted are actually sexual or dependent upon local influences.

PALPARES DAMARENSIS, n. sp. Fuscus, flavo varius. Antennæ nigræ.

Caput valde convexum, nigro-fuscum; labro flavo. Prothorax fuscus, antice flavo marginatus (interdum flavus, fusco signatus). Mesothorax metathoraxque fusci, obscure flavo varii. Alæ antice elongatæ, obtusæ, pallide flavo-albidæ; maculis costalibus (ad basin numerosis) et ad marginem dorsalem fasciisque tribus interruptis plus minus nigris aut fusco-nigris; pterostigmate venis venulisque flavis: posticæ anticis fere æquales, pallide flavo-albidæ; macula magna basin versus, fasciis duabus vel interruptis vel postice furcatis maculisque marginalibus apicalibusque nigris. Pedes nigri. Abdomen testaceum, apicem versus obscurius. ♀. Long. corp. 1" 5''' ; exp. alar. 3" 2'''.

Hab. "Damara Land" (*Andersson*). In collect. auct.

Antennæ about the length of the thorax, black, the club obtuse, but not abruptly capitate. *Head* blackish, with a few whitish hairs, the vertex very convex, with a median impressed longitudinal line; *clypeus* and *labrum* yellow; *palpi* black. *Eyes* castaneous. *Prothorax* very short, much widened posteriorly, and with the posterior angles strongly produced downwards; the margins all raised, the middle space somewhat flattened; dark fuscous, with a few white hairs, the anterior portion broadly yellow. In one example (more immature?) the whole prothorax is bright yellow, with blackish spots in the middle. *Mesothorax* blackish fuscous, with few whitish hairs; a large yellow spot occupies the posterior lobe, above which are other yellowish markings. *Metathorax* similarly coloured, with three yellowish spots.

The sides and under surface of the thorax are blackish, with yellow markings thickly clothed with white hairs. *Anterior wings* elongate, obtuse, pale yellowish white, with black markings; pterostigma yellow; a series of broad transverse costal spots, a large number of small spots on the basal fourth of the wing, and also along the apex and dorsal margin; three transverse fasciæ more or less divided into large spots, one at about a third from the base, another at two thirds, and the last following the pterostigma, the spaces between these fasciæ without dots, excepting on the margins; costal veins blackish, the rest of the veins and veinlets yellow, except where they traverse the black markings, with which they are there concolorous. *Posterior wings* similar in form to the anterior, scarcely shorter, coloured the same but with fewer small black spots, viz. several very indistinct transverse costal ones and some larger ones on the dorsal margin; on the disk at about one-quarter of the length from the base is a large isolated spot; at about the middle a broad angulated fascia, sometimes interrupted towards the dorsal margin, where it is forked; a similar, but straighter, fascia at a fourth of the length from the apex, and some apical spots forming a greatly interrupted third fascia; veins and veinlets coloured as in the anterior. *Legs* black, with black spines and white hairs; tibial spurs nearly as long as the first three tarsal joints, dark shining castaneous, slightly curved; claws similarly coloured, very long. *Abdomen* yellowish testaceous, more obscure towards the apex.

I possess two examples from Damara Land. I had at first referred this and the next species to *Tomateres*, to which in their comparatively small size and general form they bear much resemblance; but the antennæ, at any rate in *P. damarensis*, are not so short and abruptly capitate as in the species of that genus.

PALPARES FLAVO-FASCIATUS, n. sp. Fuscus. (Caput prothoraxque desunt.) Mesothorax metathoraxque fusco-nigri, cano hirsuti. Alæ anticæ elongatæ, subacutæ, subhyalinæ, densissime fusco-nigro reticulatæ; fasciis tribus completis obliquis maculisque numerosis, haud reticulatis, flavis: posticæ albæ; fasciis tribus latis fuscis, quarum duæ ad marginem dorsalem trifurcatæ. Pedes nigri. Abdomen attenuatum, fuscum; appendicibus divaricatis, curvatis, subclavatis, nigris (♂). Long. corp. (sine capite et appendicibus) 1" 11"; exp. alar. 3" 9".

Hab. "Damara Land" (Andersson). In collect. auct.

(Head and prothorax wanting in my example). *Meso- and metathorax* blackish, clothed with hoary hairs. *Anterior wings* subhyaline, densely reticulated with blackish, and with very numerous small yellow spots, costal margin black and yellow alternately; three bright yellow oblique transverse fasciæ without reticulation, viz. one, nearly equal in breadth throughout, at about a quarter of the length of the wing from the base, another, interrupted, at about a third from the apex, and another, complete, just before the apex; these fasciæ are all very broadly

margined with black on each side, the space between the last and the extreme apex black spotted with yellow; the dorsal margin is occupied with black and yellow alternate spaces; neuration for the most part blackish, but yellow in the yellow fasciæ and spots. *Posterior wings* similar in form to the anterior, very slightly narrower and shorter; white, more transparent in the basal fourth; three broad and irregular transverse black fasciæ, one rather before the middle, trifurcate on the dorsal margin, another following this and somewhat similar in form, and the third occupying the apex and enclosing a large yellow spot; some of the costal veinlets, and the point where the postcosta joins the dorsal margin, blackish. *Legs* shining black, with black spines and a few whitish hairs; tibial spurs as long as the first three tarsal joints, and with the claws dark shining brown. *Abdomen* very slender, fuscous, slightly pubescent; appendices widely diverging, curved, black, somewhat clavate at the tips.

I possess one male example of this beautiful species from Damara Land. It appears to be somewhat allied to *Palpares spectrum*, Rambur. The unfortunate absence of the head precludes a correct estimation of its generic position.

† Genus CRAMBOMORPHUS, n. g.

I propose this name for the *Palpares hæmatogaster* of Gerstaecker, which may be thus generically diagnosed.

Antennæ longæ clavatæ. *Palpi* labiales robusti, articulo ultimo longæ clavato, valde incrassato. *Prothorax* brevis, transversus. *Caput* thoraxque valde hirsuta. *Alæ* anticæ posticæque fere æquales, coriaceæ, elongatæ, perangustæ, subfalcatæ; marginibus apicali dorsalique late sinuatis; area costali ad basin paulo dilatata, biareolata, postquam uniareolata; posticæ postcosta furcata, anastomosi marginali ramo recurvo. *Pedes* breves, robusti, calcaribus paulo curvatis.

This genus should probably come next to *Stenares*.

I have little doubt that *C. hæmatogaster* is the same as *Myrmeleon sinuatum*, of Olivier, 'Encyc. Méthod.' viii. p. 121, 4. I possess one example from Damara Land.

† Genus ECHTHROMYRMEX, n. g.

Antennæ graciles, clava acuminata. *Alæ* maculatæ, ad basin augustatæ, ad apicem valde dilatatæ, rotundatæ; area costali uniareolata; subcosta et radio ad apicem fortiter curvatis; venulis transversalibus pernumerosis; areolis fere quadratis: *posticæ postcosta simplici*. *Pedes* breves, valde spinosi, calcaribus tarsorum articulo 1° æqualibus; plantula magna, penicillata.

This genus in the structure of the veins of the posterior wings

nearly approaches the South American *Dimares*, Hagen, and is altogether aberrant in the Asiatic fauna. The palpi are broken off in the single example I have seen.

- + *ECHTHROMYRMEX PLATYPTERUS*, n. s. Pallide flavescent. Antennæ rufo-ochraceæ, indistincte pallido annulatæ. Caput pallide flavum; fronte circum antennas fusco, clypeo flavo; occipite antice vitta transversa angustata fusca, postice fusco signato. Prothorax elongatus, lateribus fere parallelis; flavus, fusco signatus. Alæ hyalinæ: anticæ dimidio apicali flavo tincto; nebula magna pone medium maculisque in area subcostali, inter venas 4^m et 5^m, pone pterostigma, et ad marginem apicalem dorsalemque fuscis; venis longitudinalibus fuscis, flavo striatis: posticæ hyalinæ; fascia lata apicali fusca, albo maculata, intus albo marginata. Pedes pallide flavi, nigro spinosi. Abdomen flavidum, fusco annulatum; segmento ultimo spinis brevibus numerosis nigris instructo. (♀?) Long. corp. 1" 5^m; exp. alar. 3" 11^m.

Hab. Baghdad. In Mus. Brit.

Antennæ reddish ochreous, with very indistinct pale rings. *Head* pale yellow; occiput with a narrow transverse fuscous line in front, and fuscous markings behind; face pale fuscous about the base of the antennæ; clypeus yellow, with two impressed fuscous dots; mandibles tipped with black (palpi broken off). *Prothorax* longer than broad, narrower than the head, the sides nearly parallel, with a few long hairs, the anterior angles rounded; yellow, with two fuscous connected lines in the middle, and fuscous at the sides. *Meso- and metathorax* yellow, spotted with fuscous. *Wings* hyaline: *anterior wings* slightly excised below the extreme apex; the apical half tinged with yellowish; a very broad indistinct fuscous blotch beyond the middle, reaching half-way to the dorsal margin; the subcostal area and the space between the 4th and 5th principal veins spotted with fuscous; a fuscous blotch on the costa beyond the pterostigma, and another in the apex; the apical margin and apical portion of the dorsal with regular rounded fuscous spots; besides these markings there are numerous minute fuscous dots; pterostigma yellowish; veins and veinlets fuscous, the principal longitudinal veins streaked with whitish yellow, and many of the transverse veinlets wholly whitish yellow; the row of minute gradate veinlets bordering the apical marginal region conspicuously white: *posterior wings* with a very broad fuscous fascia occupying the apical half, broadly margined with milky white internally, and with several white spaces, viz. a large apical spot in which are two or three fuscous dots on the margin, a small spot at the pterostigmatical region, a larger spot on the dorsal margin towards the basal side of the fascia, and one or two smaller ones in the middle on this margin; basal veins and veinlets for the most part fuscous, the longitudinal veins with whitish streaks; the row of minute gradate veinlets bordering the apical marginal region very conspicuously white from being

placed in the dark fascia. *Legs* pale yellow, with numerous black spines; the tarsi beneath very thickly spinous; spurs and claws piceous. *Abdomen* yellowish, with brown rings; terminal segment provided with numerous short black spines.

The single example of this curious species was taken at Baghdad during Sir Henry Loftus's expedition to Persia.

Genus CREAGRIS, *Hagen*.

CREAGRIS NIGRO-STRIGATUS, n. sp. *Nigricans*, *brunneo varius*. *Antennæ* nigrae, tenuiter flavo annulatae; clava obtusa, subtus excavata. *Prothorax* longior quam lator, antice angustior, marginibus laterali-bus rectis. *Alæ* elongatae, subfalcatae, fere æquales, hyalinae: anticae vittis nigris, quarum una subcostali, altera obliqua submedia, longis, cæteris inter has brevioribus; margine dorsali ante medium litera V nigro signato; punctis nigris numerosis; pterostigmate nigro, externe albido; venis albidis nigrisque: posticae anticis angustiores, ad apicem acutiores; punctis paucis apicalibus nigris; pterostigmate albido. *Pedes* nigri, brunneo varii, nigro spinosi, cano hirsuti. *Abdomen* supra nigrum, infra griseo-ochraceum, sparse cano pilosum. Long. corp. 1" 2"; exp. alar. 2" 7".

Hab. Natalia. In collect. auctoris.

Blackish; thorax varied with brown. *Antennæ* about the length of the thorax, stout; the club gradually formed and very obtuse, the under-side of it concave: black, finely and closely annulated with yellowish ochreous; these annulations are broader on the club; the basal joint beneath wholly ochreous. *Head* dull blackish, the mouth yellowish ochreous; labial palpi with the last two joints nearly equal in length, the last in the form of an elongate shining black club. *Prothorax* rather longer than broad, the lateral margins nearly parallel for more than half their length, the anterior portion suddenly contracted, so that the prothorax here is much narrower than the other part, the anterior angles rounded; the anterior margin nearly straight, slightly excavated; an evident transverse impressed line proceeds across the prothorax at the commencement of the contraction, and the anterior part beyond this line is slightly elevated, forming a sort of collar; the colour is blackish varied with reddish brown. *Mesothorax* much broader than the prothorax, the anterior lobe placed in a deep emargination of the lateral lobes and with a deep longitudinal median impressed line, the hinder margin straight, coloured as in the prothorax. *Metathorax* narrower than the mesothorax. *Wings* elongate, broadest beyond the middle, the apex acute, the apical margin excised, hence giving the apex a subfalcate form: *anterior wings* with broad black vittæ, of which one commences at the base and extends to the pterostigma, occupying the whole subcostal space and margining the radius on its lower edge, another commences also at the base, following the course of the fifth

principal longitudinal vein along its superior branch as far as the apical series of gradate veinlets, which it follows almost up to the apex; between these are about four shorter streaks proceeding from the apical series of gradate veinlets along the longitudinal veins towards the middle, the lower much longer than the others; a V-shaped black mark at the termination of the postcostal vein; pterostigma internally black, joining the subcostal streak, externally whitish with a slight reddish tinge; all the apical and dorsal veinlets trifurcate or quadrifurcate, those on the apical margin marked with black at the apex of the furcations; the veins and veinlets partly black and partly whitish: *posterior wings* one-fourth narrower than the anterior, the apex more produced; without markings, excepting a blackish spot on the pterostigma internally, and one or two small blackish dots below it towards the dorsal margin; veins and veinlets mostly whitish, the radius strongly streaked with blackish. *Legs* blackish, varied with brownish, with strong black spines intermixed with scattered hoary hairs; spurs slightly longer than the first tarsal joint, regularly curved, shining brown. *Abdomen* one-fourth shorter than the wings, slender, dull blackish above, greyish ochreous beneath, sparingly clothed with short hoary pubescence.

I possess one example of this strongly marked species from Port Natal; it is allied to, and of the same form as, *C. mortifer*, Walker.

Genus GLENURUS, Hagen*.

GLENURUS PUSTULATUS, n. sp. Nigricans, flavo varius. (Antennæ mutilatæ). Caput flavum; vertice nigricante, inter oculos late transverse sulcato. Prothorax duplo longior quam lator, angustus, antice productus, flavus, fusco varius; hoc et metathorace infra flavis, utrinque nigris. Mesothorax medio nigricans. Alæ hyalinæ, cæruleo iridescentes, macula magna apicali pustulata æneo-nigra; pterostigmate albo: anticæ ad apicem latæ, rotundatæ; punctis numerosis in area subcostali nigris; plagis tribus nigro reticulatis, quarum una dorsali, duabusque apicalibus; venulis transversalibus inter venas 4^m et 5^m late nigro marginatis: posticæ anticis paulo longiores, dimidio angustiores; subcosta alba, nigro punctata. Pedes flavi, nigricante punctati. Abdomen supra nigrum, flavo signatum; infra flavum. Long. corp.?; exp. alar. antic. 2" 8"; postic. 2" 11".

Hab. Ceylon. In collect. auctoris.

Antennæ (broken) with the basal joint yellowish. *Head* small; the

* In this genus Hagen includes a mass of what appear to me very heterogeneous materials. Among them is the European *pantherinus*, for which Brauer proposed the generic term *Dendroleon*. I believe the publication of both names was so nearly simultaneous that it is difficult to decide which has priority; but as the group will without doubt be eventually split up, both terms may then be retained, that of *Dendroleon* being limited to *pantherinus* and its immediate allies.

posterior portion yellow, forming a triangular space; vertex tuberculated, blackish; a broad deep transverse channel between the eyes in front; the lower portion of the head pale yellowish; mandibles yellowish, blackish internally; palpi very small, yellowish. *Eyes* very large, subglobose, blackish. *Prothorax* very narrow, twice as long as broad, the anterior portion widened and produced; yellowish above, clouded with fuscous, with fuscous hairs. *Mesothorax* much broader than the prothorax, yellowish above, with three large black spots in the middle, a fine wavy blackish line on the attachments of the wings, with a small black point. *Metathorax* blackish, yellowish at the sides. Beneath, the whole of the pro-, meso-, and metathorax is yellow, with a black longitudinal line on each side. *Wings* hyaline, with beautiful blue iridescence, pterostigma white; on each of the wings, near the apex, beyond the pterostigma, is a large rounded inflated blackish spot with brassy reflection: *anterior wings* much dilated and rounded at the apex, the extreme apex forms a small little-evident point, beneath which the margin is slightly excised; the subcostal space is occupied by numerous small black spots (interspersed with larger ones) following the transverse nervules; between the fourth and fifth principal longitudinal veins the transverse oblique nervules are broadly margined with black; a large irregular blackish spot beyond the end of the postcosta on the dorsal margin (at the base of the oblique branch of the fifth vein); two blackish reticulated clouds at the apex; the edge of the wings, and the veins and veinlets, have short yellowish hairs; subcosta whitish, interrupted with the black spots of the subcostal space; costal veinlets whitish, very numerous, simple at the base, but mostly forked beyond the middle; apical and dorsal marginal veins mostly bisbifurcate; the longitudinal veins (excepting the subcosta), and many of the transverse nervules, mostly blackish: *posterior wings* slightly longer than the anterior, one-half narrower, apical formation similar but more pointed; subcosta whitish, with short blackish lines; most of the longitudinal veins blackish, and of the transverse nervules whitish; costal nervules all simple, except about and beyond the pterostigma; these wings are without markings, save the whitish pterostigma, and blackish inflated apical spot common to all the wings. *Legs* yellowish, with numerous blackish points forming the bases of blackish bristle-like hairs; first and last tarsal joints very long, the others small; tibial spurs slender, nearly straight, with incurved tips, shining testaceous, nearly as long as the three first joints; claws long. *Abdomen* slender, blackish above; first, second, and third segments posteriorly finely margined with yellow; fourth segment with a cuneiform yellow spot commencing in the middle, its apex reaching the posterior margin; fifth segment yellowish in the middle; the whole underside, excepting the apex, yellow.

I have one example (♂ ?) from Ceylon.

GLENURUS (?) *JAPONICUS*, n. sp. Pallide brunneus. Antennæ elongatæ, fuscæ, clava nigra. Caput supra flavo-fuscum, infra flavum; fronte inter oculos nigro signata. Prothorax elongatus; marginibus lateraliibus nigro hirsutis, fere parallelis; supra flavo-brunneus. Mesothorax metathoraxque supra brunnei, flavo varii; infra flavi, utrinque late nigri. Alæ hyalinæ, argenteo iridescentes, elongatæ, ante apicem dilatatæ, ad apicem acutæ, pterostigmate albedo: anticæ macula obliqua incurvata dorsali punctoque ad apices venarum 4^æ et 5^æ nigricantibus; vena subcostali, radio, 4° 5°-que nigris, flavo-albido punctatis; venulis transversalibus plerumque albedo-hyalinis: posticæ anticis longitudine æquales, angustiores, acutiores; plaga magna subapicali marginem dorsalem versus nigra; venis venulisque plerumque albedo-hyalinis. Pedes flavescentes, punctis spinisque nigris; tarsi nigro terminati. Abdomen gracile, brunneum, basi flavo-albido signatum. Long. corp. 1" 3''' ; exp. alar. 3''.

Hab. Japonia. In collect. auctoris.

Antennæ long, placed close together at the base, brown, slightly pubescent; club long and slender, black, concave beneath. *Head* above very obtusely triangular, yellowish brown, with darker clouds; beneath pale yellow; vertex shining black between the eyes; palpi very small, yellow; mandibles yellow, tipped with black. *Eyes* very large, subglobose, dull blackish. *Prothorax* about twice as long as broad, the sides nearly parallel but notched in the anterior portion, very pale yellowish brown, with black hairs; posteriorly on each side with a pale impressed cornucopia-shaped marking, blackish brown between these markings and with a blackish-brown line on each side. *Meso-* and *metathorax* above blackish brown, varied with yellowish. The whole of the three thoracic segments beneath is yellow, with a broad black line on each side. *Wings* elongate, hyaline, with silvery reflections; the two pairs equal in length: *anterior wings* dilated before the apex, which latter is acute with a very slight emargination below it; pterostigma whitish, with a blackish cloud internally; a large, oblique, curved blackish mark rather before the middle of the dorsal margin, and a small blackish spot at the end of the fourth and fifth principal longitudinal veins near the apex; subcosta black, with numerous yellowish spots; radius (3rd vein) and fifth longitudinal vein also black, with more distant yellowish interruptions; transverse costal nervules very numerous, for the most part simple, but furcate towards the apex, the whole of these, and many of the other transverse nervules, and some of the smaller longitudinal veins, whitish hyaline, the rest blackish; apical and subapical veins furcate or bisbifurcate; the margins and most of the veins and veinlets finely pubescent: *posterior wings* one-fourth narrower than the anterior, more acute at the apex; pterostigma whitish, internally and externally obscure; a large curved reticulated blackish blotch near the apex

towards the dorsal margin; apical margin broadly greyish (a trace of a similar margination is also seen in the anterior wings); some of the longitudinal veins obscure; most of the transverse nervulæ whitish hyaline; finely pubescent as in the anterior wings. *Legs* yellow, the tibiæ and tarsi with black dots and spines; tarsi tipped with black; first and last tarsal joints longer than the others; tibial spurs as long as the first tarsal joint; claws very long, directed downwards, nearly straight, with incurved tips, shining brown.

I possess two examples from Japan. It is placed provisionally in *Glenurus*; but it possesses many characters in common with *Creagris*, from which it differs in the great length of the antennæ, and gradually dilated wings.

CHRYSOPIDÆ.

Genus CHRYSOPA, *Leach*.

A. *Labro antice truncato aut rotundato*.

CHRYSOPA COGNATA, n. sp. Viridi-flava. Antennæ alis paulo breviores, brunneæ, basi flavæ. Caput viridi-flavum, facie punctis quatuor nigris, quarum duobus sub antennarum articulis basalibus, duobus elongatis lateralibus; palpi fulvi; labro antice truncato. Prothorax, mesothorax metathoraxque viridi-flavi, immaculati; ille fere quadratus, angulis antice obliquis. Alæ elongatæ, subacutæ, pterostigmate viridi-brunneo, elongato; anticæ venulis costalibus, postcostalibus, nonnullis cubitalibus, gradatisque plerumque nigris, reliquis viridis. Pedes viridi-flavi; tarsi fulvi. Abdomen viridi-flavum. Long. corp. 5-7"; exp. alar. 1" 6"-1" 10".

Hab. Cambodia, China, Japonia. In collect. auctoris.

Greenish yellow. *Antennæ* scarcely so long as the wings, pale brown, the base yellow. *Head* greenish yellow, vertex inflated but with a deep broad transverse depression in the centre; face with four black spots, of which one is placed below the base of each antenna, and one, more elongate, on each side below the upper ones; palpi fulvous. The whole of the *thorax* and *abdomen* greenish-yellow; *prothorax* nearly quadrate, the anterior angles oblique, a deep transverse channel in the posterior third. *Wings* elongate, somewhat acute; pterostigma long, greenish-brown, with numerous short transverse veinlets: *anterior wings* with all the costal veinlets (excepting the pterostigmatical), the postcostal, several of the cubital, the two first of those between the radius and its sector (partly), and most of the gradate series black; the rest of the veins and veinlets pale green; about 30 costal veinlets before the pterostigma; about 18 veinlets between the radius and its sector; the veinlet at the base of the subcostal area placed rather before the fourth costal one: *posterior wings*

narrower than the anterior, slightly shorter; the costal veinlets before the pterostigma, the veinlets between the radius and its sector (mostly only in the upper half of each veinlet), and most of the gradate veinlets black, the others pale green. All the veins and veinlets in both pairs of wings have fine short black hairs. *Legs* pale greenish yellow; *tarsi* fulvous; *claws* dilated at the base.

I possess numerous examples, which do not vary, from the several localities above mentioned. It is closely allied to *C. septempunctata* and *C. bipunctata*, but differs in always wanting the spot between the antennæ, &c.

CHRYSOPA TRIPUNCTATA, n. sp. Flavo-ferruginea. Antennæ alis paulo longiores, ferrugineæ; articulo basali flavo, extus linea nigra. Caput flavum; maculis quinque nigris, quarum duabus elongatis in vertice, una inter antennas, duabus subrotundatis in fronte sitis. Labrum et palpi ferruginea. Prothorax fere duplo latior quam longior, ferrugineus. Mesothorax metathoraxque flavo-ferruginei. Alæ hyalinæ, cellulis nonnullis mediis albidis; pterostigmate flavo-ferrugineo, elongato: anticæ elongatæ, ad apicem rotundatæ; venulis costalibus gradatis, et inter radium et sectorem (illisque in parte basali), nigris; venis longitudinalibus venulisque cæteris albido-flavis; cellula cubitali subquadrata: posticæ venulis costalibus, et inter radium et sectorem, nigris, cæteris fere omnino albido-flavis. Pedes flavi, tarsi ferruginei; unguiculis basi dilatatis. Abdomen ochraceum (♀). Long. corp. 4''' ; exp. alar. 11'''.

Hab. Australia. In collect. auctoris.

Antennæ about the length of, or slightly longer than, the wings, ferruginous, the basal joint yellow with a black line externally. *Head* yellow, the vertex convex, two parallel elongated spots in the middle of the vertex, a similar one, but smaller, between the antennæ, and a somewhat rounded one on each side of the front in the genæ, black; labrum and palpi ferruginous. *Prothorax* very short, twice as broad as long, ferruginous (much depressed in the dead insect). *Meso-* and *metathorax* yellowish ferruginous, the sutures darker. *Wings* elongate, rounded at the apex; hyaline, some of the cellules having a sort of whitish oxydization in the middle; pterostigma long, yellowish-ferruginous: *anterior wings* with all the costal veinlets, the gradate veinlets, those between the radius and its sector, and all those in the basal half of the wing black, the longitudinal veins and the rest of the veinlets and apical furcations pale yellowish; the veins, veinlets and margins slightly hairy; cubital cell subquadrata; 15 costal veinlets, 10 between the radius and its sector, 5 in the inner gradate series, 4 in the outer, about 6 of the veinlets on the dorsal portion of the apical margin simply furcate, the rest of the marginal veinlets simple: *posterior wings* with the costal veinlets and those between the radius and its sector black, the rest almost all yellowish. *Legs* yellow, the *tarsi*

ferruginous, the claws long, dilated at the base. *Abdomen* ochreous, slightly hairy.

CHRYSOPA NIGRICEPS, n. sp. Albida. Antennæ alis multo longiores, albæ, articulis duobus basalibus nigris. Caput, et thorax supra, nigricanta, infra albida. Alæ anticæ latæ, obtusæ, macula magna basali punctoque ad sectoris initium, nigris, plaga magna ante apicem, punctis striaque marginem dorsalem versus fuliginosis; venis venulisque albis, in signatis nigris, pubescentibus: posticæ dimidio angustiores; macula magna costali ante apicem, punctoque marginis dorsalis medium versus, fuliginosis; venis venulisque ut in anticis. Pedes albi. Abdomen albidum, linea dorsali nigra. Long. corp. 5''; exp. alar. 1'' 4''.

Hab. Ega, Brasilia (Bates). In collect. auctoris.

Antennæ much longer than the wings, whitish, the two basal joints black.

Head and *thorax* deep blackish fuscous above, whitish beneath; *eyes* black; *labrum* whitish; *palpi* whitish, annulated with fuscous; *prothorax* much broader than long, the anterior angles oblique. *Wings* hyaline: *anterior wings* rather broad, obtuse; a dark blackish blotch occupies the extreme base, a small black dot at the point where the sector parts from the radius; a large irregular smoky fuscous blotch on the costa before the apex, and some dots and an irregular streak along the external series of gradate veinlets; veins and veinlets everywhere white, excepting where they traverse the dark markings, when they are black; marginal cilia rather long; the veins and veinlets with long but distant hairs: *posterior wings* nearly one half narrower than the anterior, more acute, veins and veinlets similar; a smoky fuscous spot on the costa before the apex, and a dot towards the dorsal margin about the middle. *Legs* white, the posterior tarsi slightly testaceous; claws long, slightly dilated at the base, testaceous. *Abdomen* whitish, rather thickly clothed with short silky pubescence; a blackish dorsal line, becoming broader towards the apex.

CHRYSOPA PALLICEPS, n. sp. Pallide viridi-flava. Antennæ alis fere duplo longiores, griseo-albidæ, articulis duobus basalibus piceo-nigris. Caput pallide viridi-flavum; fronte nitente nigra; palpis albidis, nigro annulatis. Prothorax fere quadratus, supra pallide viridi-flavus, infra albus. Mesothorax metathoraxque supra piceo-nigri, infra albi. Alæ hyalinæ: anticæ obtusæ; plaga ante costæ apicem magna, fenestrata, fusca; venis venulisque albidis, nonnullis ad basin, gradatis, illisque in plaga fuscis: posticæ fere dimidio angustiores, acutæ, plaga magna ante costæ apicem fusca; venis venulisque albidis, in plaga fuscis. Pedes albi. Abdomen pallide viridi-flavum, linea dorsali apicali nigra. Long. corp. 3''; exp. alar. 1''.

Hab. Ega, Brasilia (Bates). In collect. auctoris.

Antennæ very slender, almost twice the length of the wings, pale greyish white; the two basal joints pitchy black. *Head* with the vertex pale greenish-yellow; face shining black; *eyes* black; *palpi* whitish, an-

nulated with black. *Prothorax* nearly quadrate, above pale greenish yellow, beneath whitish. *Meso-* and *metathorax* above pitchy black, beneath whitish. *Wings* hyaline, the margins and neuration strongly ciliated: *anterior wings* with a large fuscous blotch on the costa before the apex, enclosing three or four pale cellules below the radius; a fuscous clouding at the extreme base; veins and veinlets whitish, the two first costal veinlets, those in the clouding at the extreme base of the wing, two or three about the commencement of the sector, the gradate series, and those in the fuscous blotch dark blackish fuscous: *posterior wings* about one-half narrower than the anterior, acute; a large fuscous spot on the costa before the apex; veins and veinlets whitish, some of the costal, the gradate series, and those in the costal spot, blackish. *Legs* white, ciliated; the tips of the tarsi obscure.

This species is closely allied to *C. nigriceps*; both are extremely beautiful and delicate insects, and allied to *C. elegans*, Guérin, belonging to a group apparently peculiarly Brazilian.

B. *Labro antice emarginato*.

CHRYSOPA GIGANTEA, n. sp. Olivaceo-grisea. Antennæ alis breviores, nigræ, articulis duobus basalibus griseis. Palpi labrumque rufo-brunnei. Prothorax brevis, vix longior quam lator; utrinque lineis duabus parvis nigris. Alæ hyalinæ, vix albido tinctæ; spatio pterostigmatico olivaceo-griseo, elongato; venis longitudinalibus albidis nigro interruptis; venulis transversalibus costalibus, gradatis, post-costalibus nonnullisque incrassatis ad basin omnino nigris, reliquis plerumque nigro terminatis; venis venulisque breviter nigro hirsutis. Pedes pallide grisei; tibiis basi nitente nigro annulatis; unguiculis rufo-testaceis, basi dilatatis. (♀). Long. corp. 1"; exp. alar. 2" 3".

Hab. Natalia. In collect. auctoris.

Antennæ shorter than the wings, thick, deep black, with the two basal joints pale grey. *Head* small, pale olivaceous grey; the eyes (in death) concolorous; labrum and palpi shining reddish brown. *Prothorax* scarcely as long as broad, slightly notched on each side in front and with the anterior angles acute; pale olivaceous grey, the anterior angles slightly reddish, two short black lines on each side. *Meso-* and *metathorax* olivaceous grey varied with yellow in the middle. *Wings* elongate, whitish hyaline; pterostigmatic space elongate, olivaceous, the longitudinal veins whitish, with strong black interruptions; the whole of the costal veinlets (excepting those towards the apex), the veinlets in the subcostal space, the gradate series, and four or five very strong ones at and below the cubital cells totally black, those between the radius and its sector, and those between the cubitus anticus and posticus, black at each end, the marginal forks blackish at their bases, the rest of the veinlets whitish; all the veins and veinlets with short black hairs, each hair springing from a black point; the costa grey,

with a blackish line at the junction with the thorax: *anterior wings* with about 24 costal veinlets; the transverse veinlet at the base of the subcostal space placed level with the fifth costal one, about 7 veinlets at the apical end of this space; 4 cellules in the postcostal area. *Legs* pale grey; all the tibiæ with a shining black ring at their junction with the femora; claws shining reddish brown, dilated at their bases. *Abdomen* very robust, dilated and laterally compressed; yellowish grey, the ventral sutures yellow, the sides grey.

Of this magnificent insect I possess one female from Natal.

CHRYSOPA RUFOSTIGMA, n. sp. Pallide flava, fusco varia. Antennæ alis paulo breviores, nigræ, articulo basali aurantiaco. Caput aurantiacum, vertice macula semicirculari fuscescens; palpi aurantiaci; labrum vix emarginatum. Prothorax dimidio et ultra latior quam longior, antice rotundatus, pallide flavus, utrinque piceo-brunneo signatus, medio profunde longitudinaliter sulcatus. Mesothorax pallide flavus, antice et utrinque postice nitens niger, punctis nonnullis mediis nigris. Metathorax pallide flavus, postice et utrinque niger. Alæ angustæ, elongatæ, acutæ, albido-hyalinæ; pterostigmate elongato, rufo: anticæ costa vix excisa; punctis tribus basalibus, venulis costalibus basin versus in parte basali nonnullisque pone medium nigris, venarum venularumque cæteris pallide flavo-albidis: posticæ venulis nonnullis pone medium nigris, cæteris ut in anticis. Pedes flavi; femoribus intermediis et posterioribus annulo ante apicem lineaque intus fuscis; unguiculis basi paulo dilatatis. Abdomen piceo-brunneum, supra flavo varium. (♀) Long. corp. 6''' ; exp. alar. 1" 1'''.

Hab. Natalia. In collect. auctoris.

Antennæ rather shorter than the wings, black, the basal joint orange.

Head orange; the vertex yellowish behind, in the middle with a horseshoe-shaped fuscous mark; front slightly obscure in the middle anteriorly; labrum and palpi orange-coloured, the former very slightly emarginate. *Prothorax* more than half as broad as long, rounded in front, with a deep longitudinal groove in the middle; pale yellow, with a curved fuscous streak on each side, and a spot of the same colour at the anterior angles. *Mesothorax* pale yellow, a large elongate transverse spot on the anterior margin, a large rounded spot on each side posteriorly, and several smaller spots in the middle shining black. *Metathorax* pale yellow, posteriorly and on each side black. The underside of the meso- and metathorax with dark brown markings. *Wings* long and narrow, acute, whitish hyaline; pterostigma $2\frac{1}{2}$ ''' long, reddish: *anterior wings* with the costal margin very slightly excised in the middle; three small black spots at the base towards the dorsal margin; the first six costal veinlets at their bases, the postcostal veinlets and a few above them, the sector for a space in its middle, and the base of the veinlets to the radius, starting from this space, the last seven gradate veinlets of the inner series, and the

veinlets between these and the outer series black, all the other veins and veinlets pale whitish yellow, all clothed with very short hairs; about 25 costal veinlets, 17 between the radius and its sector, about 12 in the outer gradate series, 11 in the inner; these two series are scarcely parallel, being more approximate towards the base; the transverse veinlet at the base of the subcostal space placed about level with the fourth costal veinlet: *posterior wings* with a space in the middle of the sector, the base of the veins running from that space to the radius, and the inner gradate series black, the others pale whitish yellow. *Legs* yellow, a ring before the apex of the intermediate and posterior femora, and a line on the inner side of these brown; tarsi darker, claws slightly dilated at the base. *Abdomen* pitchy brown, the margins of the segments above and at the sides yellowish; the penultimate ventral segment very long, forming a shining reddish-brown plate; the antepenultimate ventral segment also long, with an elongated depression on its lower edge.

Allied to *C. æqualis*, Walker.

CHRYSOPA CLARA, n. sp. Griseo-ochracea. Antennæ alis valde longiores, flavo-albidæ, articulo basali supra sanguineo tincto. Caput vertice antice linea angulata nigra; clypei vitta transversa sanguinea; Prothorax elongatus, antice angustatus, linea media impressus; puncto utrinque fusco. Alæ latæ, albido-hyalinæ; pterostigmate flavo, intus fusco notato: anticæ venis venulisque flavo-albidis, longe hirsutis; radio ad basin puncto nigro; venulis costalibus ad initium, nonnullis ad basin inter radium et sectorem, furcula postcostali serieque gradata externa nigris; cellula ad furcam postcostæ fuliginosa: posticæ angustiores, venis venulisque omnino flavo-albidis. Abdomen flavum; dimidio apicali nigro punctato. Pedes flavo-albidi. Long. corp. $6\frac{1}{2}$ ''' : anten. $1'' 7'''$; exp. alar. $1'' 10'''$.

Hab. Ega, Brasilia (*Bates*). In collect. auctoris.

Antennæ nearly twice the length of the wings, yellowish white, the basal joint marked with pinkish above. *Head* greyish ochreous; *vertex* flattened, a fine angular black line in the anterior portion behind the basal joints of the antennæ; *front* with a pinkish spot immediately below the basal joints of the antennæ, clypeus with a broad transverse pinkish band; *palpi* yellowish; *eyes* lead-coloured. *Prothorax* with the length twice the breadth, much narrowed in front, above with a deep median impressed longitudinal line; greyish ochreous, paler beneath, a fuscous spot on each side placed more on the under surface than on the upper. *Meso- and metathorax* greyish ochreous, the lobes prominent. *Wings* broad, the apical margin rounded, but the extreme apex slightly acute; whitish hyaline; pterostigma yellow, with a fuscous mark internally: *anterior wings* with the veins and veinlets very pale yellowish white and, with the margins, longly pubescent; a black spot at the extreme base of the radius at its junction with the

mesothorax; middle costal veinlets black at their commencement on the margin, the first wholly black; the commencement of the sector, and the four first veinlets between it and the radius, almost wholly black; several veinlets below the commencement of the radius and the whole of the outer gradate series, and several in continuation between the branches of the cubitus, wholly black; postcostal furcation and the veinlet beyond it black, *the cellule between fuliginous*; gradate series scarcely parallel; marginal veinlets simply forked; pterostigmatical veinlets numerous: *posterior wings* with all the veins and veinlets pale. *Legs* pale yellowish white, pubescent. *Abdomen* yellow, the apical half with black spots.

This beautiful insect is very closely allied to *C. varia*, Schneider, but differs especially in a somewhat different arrangement of the black veinlets, and in the fuliginous cellule at the end of the postcosta; it is also larger.

MANTISPIDÆ.

Genus TRICHOSCELIA, *Westwood*.

TRICHOSCELIA LATIFASCIA, n. sp. Flavo-ochracea. Antennæ, caput, prothoracis dimidium antice et abdominis apex nigra; prothoracis dimidium postice, mesothorax, metathorax et abdominis dimidium basale flavo-ochracea. Alæ nitentes albo-hyalinæ; anticæ maculis duabus oppositis ante medium nigro-fuscis; fascia lata subapicali fusca; venis venulisque flavis, nonnullis ad basin nigris: posticæ parvæ; margine costali ad basin pterostigmateque nigro-fuscis; macula ad basin marginis dorsalis fusca. Pedes flavo-ochracei; antici trochanteribus, femoribusque infra, nigro signatis; postici femoribus nigris. Long. corp. $4\frac{1}{2}'''$; exp. alar. antic. $10\frac{1}{2}'''$; post. $7'''$.

Hab. Ega, Brasilia (*Bates*). In collect. auctoris.

Antennæ and *head* black; the joints of the former are transverse and triangular, hairy, almost spinous. *Eyes* grey. *Prothorax* with the length more than twice the breadth; anterior half black, posterior half yellowish ochreous. *Meso-* and *metathorax* broader than the head with the eyes, yellowish-ochreous. *Abdomen* with the basal half yellowish ochreous, the apical half black; apex obtuse, with two minute, curved, and distant testaceous spine-like appendices. *Wings* whitish hyaline, very shining: *anterior wings* with two large blackish fuscous opposite spots before the middle, one on the costal margin, the other on the dorsal margin; a very broad transverse fuscous fascia before the apex, leaving only a small hyaline apical space; veins and veinlets yellow, those in the dark markings, and the base of the subcosta, radius, and cubitus black; about 13 costal veinlets before the pterostigma, pterostigmatical veinlets very numerous, about 9 gradate veinlets, and one or two further in towards the dorsal margin, veinlets

on the dorsal margin simply furcate, those on the apical margin for the most part twice forked; all the veins and veinlets finely hairy: *posterior wings* one-third shorter than the anterior, and much narrower; pterostigma blackish fuscous; a fuscous spot on the dorsal margin towards the base; veins and veinlets black, excepting the middle portion of the costa and subcosta, which are yellow; 6 gradate veinlets. *Legs* yellow, the dilated portion of the anterior femora largely marked with black beneath, the teeth black, the trochanters black; intermediate pair with the base of the femora black; posterior pair with the base of the femora and the tarsi (wholly, except the extreme base) black.

PANORPIDÆ.

Genus PANORPA, *Linneé*.

The following is a synopsis of the species known to occur in Japan:—

1. PANORPA JAPONICA, *Thunberg, Nov. Ins. Sp. Dissert.* iii. pl. 67. f. 9. Nigra. Alæ albido-hyalinæ; fasciis duabus perlatis, quarum una pone medium (ad costam intus aliquando furcata), altera apicalis, nigris. Pedes rufescentes. Abdomen cylindricum; ♂ segmentis 1^o—4^m transversis; 5^o elongato; 6^o quinto fere æquali, vix tenuiore, margine posteriore truncato, lateribus paulo productis; 7^o quam 6^m longiore, tenuiore, gradatim incrassato, margine posteriore oblique truncato; 8^o brevi, transverso, obconico, forcipe perelongata, rufo-fusca, ad basin intus fimbriata; appendicibus brevibus, parvis. ♂. Long. corp. 12^{'''}; exp. alar. 1^{''} 7^{'''}.

♂. *Body* totally deep shining black. *Wings* whitish hyaline, a little obscure towards the base; with two very broad black fasciæ, one beyond the middle, the other occupying the apex, the first fascia is sometimes slightly furcate internally on the costa, or there is at this place a small detached spot; pterostigma scarcely coloured; all the veins and veinlets black; the subcosta joins the costa slightly beyond the middle, far before the pterostigma. *Legs* reddish, the tarsi more obscure; claws with 4 or 5 long teeth below the apex. *Abdomen* long, cylindrical, the first four segments transverse; 5th long; 6th about as long as the 5th, and slightly narrower, the apical margin truncated, with the sides slightly produced; 7th longer than the 6th, thin, but gradually incrassated, the apical margin obliquely truncated; 8th transverse, broad, obconical, the forceps very long, fringed internally at the base, reddish brown; appendices very short and small.

I have not a perfect specimen of the ♀.

There can be no doubt that this is the insect intended by Thunberg.

2. PANORPA KLUGII, *mihi*. Piceo-brunnea; rostro pedibusque plus minus rufo-testaceis. Alæ testaceo-hyalinæ; fasciis duabus, quarum

una angusta pone medium, altera lata apicalis, maculisque ante fasciam primam nigro-fuscis. Abdomen gracile; ♂ segmentorum 1ⁱ-4ⁱ marginibus lateralibus vix alatis; 2° supra in medio paulo producto; 6° cylindrico, elongato, truncato; 7° quam 6^m longiore, graciliore, oblique truncato; 8° elongato-conico, forcepe elongata, intus ad basin fimbriata; appendicibus linearibus, parvis. ♀ prothorace pectoreque rufis. Long. corp. ♂ 9^{'''}, ♀ 6^{'''}; exp. alar. ♂ 1" 3^{'''}, ♀ 1" 1^{'''}.

- ♂. The whole of the body excepting the rostrum, pitchy-brown; rostrum reddish. Legs reddish fuscous; claws with three teeth internally below the apex. Wings hyaline, with a decided testaceous tinge; with two blackish fuscous fasciæ,—one narrow, beyond the middle; the other broad, occupying the apex; before the first fascia are one or two detached fuscous spots (sometimes absent); veins blackish fuscous at the base, somewhat testaceous between the fasciæ; the subcosta joins the costa in the middle. Abdomen slender, moderately long; the first four segments transverse, the lateral margins slightly winged; 2nd segment with its posterior margin slightly produced in the middle above; 5th subcylindrical, long, truncated; 6th about the length of the 5th, and thinner, truncated, the lateral margins slightly angular; 7th longer than the 6th, gradually incrassated, obliquely truncated; 8th forming an elongated cone, the forceps very long, and fringed internally at the base; the appendices are linear and small. ♀ differs only in having the prothorax and the whole of the breast reddish; the legs redder. Abdomen compressed, short.

This may be *P. japonica*, of Klug, 'Abhandl. Akad. Berlin,' 1836; but his description would seem to indicate a species in which the first fascia is broad, and more closely allied to the true *japonica* of Thunberg.

3. *PANORPA MACROGASTER*, n. sp. ♂. Nigra. Alæ albido-hyalinæ, fasciis duabus latis, quarum una pone medium, altera apicalis, nigro-fuscis, albido longitudinaliter striatis; punctis nonnullis ante fasciam primam et inter fascias, nigro fuscis; venis piceo-nigris, inter fascias testaceis. Pedes rufi. Abdomen valde elongatum, robustum, segmentorum 1ⁱ-4ⁱ marginibus lateralibus paulo alatis; segmento 2° supra postice in medio producto; 6° cylindrico, quam 5^m paulo angustiore, postice truncato, utrinque in dentem producto; 7° quam 6^m valde angustiore, longiore, gradatim incrassato; 8° brevi, obconico, forcepe rufa, perelongata. Long. corp. 14^{'''}; exp. alar. 1" 8^{'''}.

♀. Minor. Abdomen gracile, dimidio basali alato; segmentis gradatim angustioribus. Long. corp. 6½^{'''}; exp. alar. 14^{'''}.

- ♂. Antennæ, head, rostrum, palpi, and the whole of the body black; the membranous portion between the abdominal segments reddish. Wings whitish hyaline; with two broad blackish fuscous fasciæ, one beyond the middle, the other occupying the apex, these fasciæ are traversed

longitudinally by lines of the whitish ground-colour in the middle between the veins, the dark colouring consisting of a broad margining of the longitudinal veins, and in the apical fascia there are several similarly margined transverse vienlets, hence this fascia has a fenestrated appearance; before the first fascia are two or more fuscous spots, sometimes uniting and forming a more or less complete basal fascia; between the fasciæ there is generally a fuscous spot on the dorsal margin, which sometimes unites with the first fascia, and forms a little fork; pterostigma yellow; basal veins black, most of those between the fasciæ more or less testaceous; the subcosta joins the costa scarcely beyond the middle, far before the pterostigma. *Legs* rufous; claws with three obtuse teeth below the apex. *Abdomen* very long and robust; the first four segments more or less transverse, the lateral margins winged; second segment with its posterior margin above produced in the middle; 5th segment nearly cylindrical, longer than broad, scarcely narrower than the fourth; 6th cylindrical, about as long as the 5th, and narrower, truncated at the apex, the apical margin produced at each side into a tooth; 7th longer than the 6th and very much thinner, cylindrical, gradually thickened towards the apex, which is truncated, with the margins slightly concave above and beneath; 8th short, broadly obconical, the forceps very long, the points crossing each other, reddish brown.

♀. Much smaller than the ♂. In the specimen before me the basal spots on the anterior wings form a fascia. *Abdomen* slender, the apical segments very thin; basal segments laterally winged, as in the male; two last segments equal, together not so long as the antepenultimate.

It is remarkable that in the neururation of all the three above-described species, the subcosta joins the costa at, or scarcely beyond, the middle, a peculiarity which, in the European species, is seen only in *P. variabilis*.

4. PANORPA, sp. nov. "Mit ganz schwarzen weiss gefleckten Flügeln." Coll. Hagen. Vide *Stett. ent. Zeit.* 1867, p. 90.

5. PANORPA LEUCOPTERA, Uhler, *Proc. Acad. Scien. Philadelphia*, 1858. Alæ albæ, punctis nigris conspersæ.

I have seen a female of this; the male is yet unknown.

A revision of the "*List of the specimens of Neuropterous Insects in the collection of the British Museum. Part II.*, 1853. By F. WALKER," as far as the end of the genus *Myrmeleon*, pp. 193-410.

In making this revision I have examined all the examples indicated as being in the collection at the time of the publication of

the list, both those described as new, and those referred to previously named species; but I have paid no regard to examples acquired since the publication and placed under the various labels.

Family SIALIDÆ.

Genus SIALIS, p. 194.

SIALIS LUTARIUS, p. 194, 1; all the specimens=*S. lutaria*, L.

S. INFUMATUS, p. 195, 2; all=*S. infumata*, Newm.

S. FERRUGINEUS, p. 195, 3=*S. americana*, Rambur.

Genus ITHONE, p. 197.

ITHONE FUSCA, p. 196, 1=*I. fusca*, Newm. This genus belongs to the *Hemerobiidæ*.

Genus MEROPE, p. 196.

MEROPE TUBER, p. 196, 1=*M. tuber*, Newm. This genus belong to the *Panorpidæ*.

Genus CHAULIODES.

CHAULIODES PECTINICORNIS, p. 198, 1=*C. pectinicornis*, L.

C. RASTRICORNIS, p. 198, 2=*C. rastricornis*, Ramb.

C. SINENSIS, p. 199, 3=*C. sinensis*, Walker.

C. CALIFORNICUS, p. 199, 4=*C. californicus*, Walker.

C. SIMPLEX, p. 200, 5=*C. simplex*, Walker.

C. SUBFASCIATUS, p. 200, 7=*C. subfasciatus*, Walker.

C. FASCIATUS, p. 201, 8.

I have no doubt that these examples are American, and that the locality "New Holland" is erroneous. According to the foliated antennæ of the ♂ they should=*C. lunatus*, Hag. (Proc. Ent. Soc. Philadel. vol. ii. p. 180; *C. serricornis*, Hag., Neurop. of N. Amer. p. 190), and not the true *serricornis*.

Genus HERMES, p. 201.

This genus, which equals *Neuromus* of Rambur, is made up of species of *Chauliodes* and *Corydalus*.

HERMES MACULATUS, p. 202, 1; probably=*Chauliodes serricornis*, Say, but some of them may be *lunatus*.

H. RUFICOLLIS, p. 202, 2=*Chauliodes maculipennis*, Gray. I know

not for what reason Gray's name is deposited in favour of *ruficollis*, Rambur, to which it is long anterior.

H. MACULIFERA, p. 203, 3=*C. maculipennis*, Gray, ♀.

H. SINENSIS, p. 203, 4=*Chauliodes sinensis*, Walker. As this name is already employed in *Chauliodes*, I propose to change it to *Bowringi*.

H. GUTTIFERUS, p. 204, 5=*Chauliodes guttiferus*, Walker. No locality is given, but examples have been since received from Australia.

H. DUBITATUS, p. 204, 6=*Chauliodes californicus*, Walker, ♀.

H. INDECISUS, p. 204, 7=*Chauliodes rastricornis*, Rambur, ♀.

H. ANTICUS, p. 205, 8=*Chauliodes sinensis*, Walker, ♀.

H. DIVERSUS, p. 205, 9=*Chauliodes diversus*, Walker.

H. PRASINUS, p. 206, 10. I cannot imagine what fatality induced Mr. Walker to place this insect (described as *Chloroperla prasina* by Newman) among the *Sialidæ*, with which it has nothing in common. It is somewhat allied to *Eusthenia* of Westwood; and I recently proposed for it the generic term *Stenoperla*; vide 'Trans. Ent. Soc.' ser. 3. vol. v. p. 354.

H. TESTACEUS, p. 206, 11=*Corydalis testacea*, Rambur.

II. HIEROGLYPHICUS, p. 206, 12=*Corydalis hieroglyphica*, Rambur. This and *testaceus* are very closely allied, although coming from such opposite localities.

H. ALBIPENNIS, p. 206, 13=*Corydalis albipennis*, Walker.

II. COSTALIS, p. 207, 14=*Corydalis costalis*, Walker. This species is ill-placed in *Corydalis*, and does not agree well with *Chauliodes*, on account of the numerous transverse veinlets. It seems to vary much in the markings, probably according to the degree of maturity attained by the individuals. The, as yet, not rediscovered *Hemerobius grandis*, of Thunberg, from Japan, should be somewhat allied.

Genus CORYDALIS, p. 208.

C. CORNUTA, p. 208, 1. The example from Columbia=*C. armata*, Hagen (*cornuta*, Rambur); the two other specimens are the true *cornuta*.

Genus RAPHIDIA, p. 209.

I leave the exact determination of the species of this genus for a future occasion, when I shall have worked them out for my 'Monograph of the British *Planipennia*.' The species are very

closely allied, but can be separated with certainty by means of the anal parts of both sexes.

R. VARIA, p. 212, 13, belongs to the *Mantispidæ*, and=*Trichoscelia varia*, Walker*. I was once present in the British Museum when a recently received nest of *Myrapetra scutellaris*, from Monte Video, was opened, and saw therein numerous living examples of *T. varia*, in all its stages. It is probable that all the species of *Trichoscelia* have similar parasitic habits.

Family HEMEROBIIDÆ.

Genus MANTISPA, p. 213.

M. SEMIHYALINA, p. 214, 1=*M. semihyalina*, Serville. I possess examples from Obajos on the Amazons, which differ in having the dilated anterior femora wholly blackish, the other legs somewhat testaceous.

M. BRUNNEA, p. 214, 2=*M. brunnea*, Say.

M. VARIA, p. 214, 3=*M. varia*, Erichs. This is very closely allied to *brunnea*, but probably distinct; the lower edge of the anterior darker portion of the wing runs straight from base to apex, and is not carried downwards to the apical portion of the dorsal margin as in *brunnea*.

M. DECORATA, p. 215, 6=*M. decorata*, Erichs.

M. PROLIXA, p. 215, 7=*M. —?*; not *prolixa*, Erichs.

M. PUSILLA, p. 216, 10=*M. pusilla*, Pallas. The "var." from the East Indies (Ceylon) is different, and allied to *Cora* and *rufescens*.

M. PAGANA, p. 217, 11=*M. styriaca*, Poda.

M. PERLA, p. 217, 12=*M. —?*; the example is of doubtful origin, and, I think, distinct from *perla*; the anterior femora scarcely thicker than the coxæ, and almost cylindrical.

M. TENELLA, p. 218, 16=*M. tenella*, Erichs.

* Since the above was written, Prof. Westwood has published descriptions of many new species of *Mantispidæ* (vide Trans. Ent. Soc. Lond. ser. 3, vol. v. pp. 501-508). Among them is a species named *Mantispa myrapetrella* (p. 505), which he says cannot possibly be the same as *R. varia* of Walker. Nevertheless the two names are undoubtedly synonymous; but, setting aside the vexed question as to the right of insufficient or erroneous descriptions to carry priority, it is desirable that Westwood's name should be retained, as a *Mantispa varia* previously existed. I cannot understand why Westwood should retain *myrapetrella* in *Mantispa* proper, rather than in *Trichoscelia*, which he still calls only a subgenus. The most important structural difference in the two genera (for I consider *Trichoscelia* undoubtedly a *genus*) consists in the form of the prosternum; and *myrapetrella* has that of *Trichoscelia*, and not the solid structure seen in *Mantispa* proper.

M. RUFESCENS, p. 220, 24=*M. rufescens*, Erichs.

M. CORA, p. 221, 28=*M. Cora*, Newman. The Malabar example is the type specimen; the other is not different.

M. AUSTRALASIÆ, p. 223, 33, for the most part *M. australasiæ*, Guérin; but one example from Van Diemen's Land is *M. vittata*, Guérin, and another from "New Holland," without any special indication of locality, is perhaps an undescribed species.

M. DELICATULA, p. 224, 36=*M. delicatula*, Westwood.

M. DISCOLOR, p. 224, 37=*M. discolor*, Westwood; the type specimen.

M. BISERIATA, p. 225, 38=*M. biseriata*, Westwood; the type specimen. This species differs so greatly from the normal form of *Mantispæ* that I propose for it the generic term *Ditaxis*, which may be thus briefly diagnosed:—

DITAXIS*, n. g.

Mantispæ similis; sed alis latioribus, valde obtusis; costa a subcosta apicis tenus distante; area costali latiore; venularum gradatarum seriebus duabus.

M. 4-TUBERCULATA, p. 225, 39=*M. 4-tuberculata*, Westwood.

M. LINEOLATA, p. 226, 43=*M. lineolata*, Westwood; the type specimen.

M. INDICA, p. 226, 44=*M. indica*, Westwood; a type specimen.

M. FENELLA, p. 227, 46=*Trichoscelia fenella*, Westwood; the type specimen.

M. VIRIDIS, p. 227, 47=*M. viridis*, Walker. This is evidently allied to *viridula*, Erichson, but, I think, distinct.

Genus HOPLOPHORA, p. 228.

This belongs to the *Mantidæ* (Orthoptera).

Genus NYMPHES, p. 229.

N. MYRMELEONIDES, p. 230, 1=*N. myrmeleonides*, Leach.

N. EXTRANEUS, p. 230, 2=*Myiodactylus* (?) *extraneus*, Walker. My previous assertion ('Journal of Entomology,' vol. ii. p. 111), that this

* I have since received a paper by Brauer ("Beitrag zur Kenntniss der Mantispiden-Gattungen," Verhandl. d. k.-k. zool.-bot. Gesellschaft in Wien, 1867, pp. 281-286), in which he places *M. biseriata* in the genus *Drepanicus* of Blanchard. This Chilean genus is quite unknown to me, save by description; and I feel rather doubtful if our Australian insect will fall into it satisfactorily, and therefore, for the present, retain my proposed generic term *Ditaxis*.

insect possesses ocelli, was incorrect : the vertex has little prominences which have much the appearance of ocelli, but, on closer examination, I can discover nothing to indicate that they are more than blind tubercles. The plantulæ are double as in *Nymphes* and *Myiodactylus* ; yet the antennæ are those of *Osmylus*. I retain it doubtfully in *Myiodactylus* for the present. It is Australian, and the ♀ possesses ventral valves and a borer analogous to those described lower down under *Stenosmylus stenopterus*.

N. SEJUNCTUS, p. 230, 3=*Myiodactylus sejunctus*, Walker. Here I again erred in referring this to *Osmylus* ; it is a true *Myiodactylus*, but of a form different from that *M. osmyloides*, the typical species, and in outward appearance is more like a *Chrysopa*. The following description is drawn up from a male in my collection from Northern Australia :—

MYIODACTYLUS SEJUNCTUS, *Walker*. Viridi-flavus. Antennæ flavæ, apicem versus subvirescentes. Caput flavum, vertice linea media impressa rufescente ; mandibulæ nigræ. Oculi plumbacei. Prothorax longior quam latior, antice angustior, viridi-flavus, longe flavescenti-hirsutus ; antice macula media lanceolata piceo-brunnea. Mesothorax metathoraxque brunneo-flavi ; ille antice fovea media piceo-brunnea. Alæ elongatæ, angustatæ, hyalinæ, costa fere recta, area costali angusta, pterostigmate vix obscuriore ; anticæ venis longitudinalibus pallide viridibus, venulis transversalibus nigris (costalibus in parte pallidis) : posticæ venis venulisque fere omnino pallide viridibus ; costalibus ad apices, pterostigmatalibus omnino, nigris. Pedes virescentes. Abdomen flavum, utrinque nigro punctatum ; appendicibus analibus magnis, superioribus in digitulos furcatos productis, inferioribus processu cylindrico fere hyalino, viridi terminato, instructis. (♂.) Long. corp. 6''' ; exp. alar. 1" 9'''.

Hab. in Australia boreali et occidentali. In collect. auct. et Mus. Brit.

Antennæ not half the length of the wings, thickened beyond the middle, yellow, somewhat greenish towards the apex, slightly hairy. *Head* yellow, the crown with a narrow impressed longitudinal median brownish line ; mandibles blackish. *Eyes* lead-colour. *Prothorax* about twice as long as broad, narrowed in front, hairy, yellow, with a lanceolate pitchy brown spot in the middle of the anterior portion, and a vestige of a spot on the posterior margin. *Meso- and meta-thorax* much broader than the prothorax, yellow, the former with a pitchy brown fovea in the middle of the anterior median lobe. *Wings* elongate, narrow, subacute, the costal margin nearly straight, and the costal area narrowed ; hyaline, the pterostigmatal region rather obscured, all the veins and veinlets finely hairy, the costal margins minutely nigro-punctate : *anterior wings* with all the longitudinal veins (excepting the last on the dorsal margin) pale greenish ; transverse veins and marginal veinlets black, those in the costal area with

a greenish interruption towards their bases; costal veinlets before the pterostigma for the most part simple, apical marginal veinlets mostly simply furcate: *posterior wings* narrower than the anterior; all the veins and veinlets greenish, the apical marginal furcations, the base of the costal veinlets, the apex of those between the radius and its sector, and those in the pterostigmatal region black. *Legs* greyish with a greenish tinge, pilose, the claws tipped with brown. *Abdomen* yellow, obscurely spotted with blackish at the sides, slender, the terminal segment bearing large appendices. From the superior surface of the last segment proceeds a broad yellow plate thickly clothed with strong yellow hairs; this plate is somewhat bent under, and from each lateral margin proceeds a finger-shaped greenish yellow appendice, which is deeply furcate, the branches widely divaricating, and with a small tubercle or tooth in the base of the fork; the ventral segment is also produced into a large plate, on each side of which is a nearly straight cylindrical process directed upwards, nearly transparent, but green at the apex, which is deeply divided, so that it appears to end in two sharp brownish teeth; the ventral plate bears in the middle an elongate, rectangular, truncated, cover-like piece, placed in the cavity between the dorsal and ventral plates and united to the latter.

M. osmyloides, Brauer, the typical species, is distinguished by its very broad wings, rounded costa, and broad costal and marginal areas. *M. sejunctus* agrees with it in all important characters, save the shape of the wings, which is only specific. I may remark that the example of *osmyloides* in my collection bears the locality-label "China;" but this is probably an error, which is additionally likely, considering that I have two species from Australia.

Although *Myiodactylus* differs in many important characters from that noble insect *Nymphes myrmeleonides*, yet the filiform antennæ, and the absence of ocelli, seem fully to justify Brauer in placing it with that insect in the family *Nymphidæ*, instituted by Leach for the reception of *N. myrmeleonides*, which in its nerval characters nearly approaches the *Myrmeleonidæ*.

Another species of *Myiodactylus* I describe as under:—

MYIODACTYLUS ARMATUS, n. sp. Viridi-flavus. Antennæ pallide flavæ, viridi terminatæ. Caput flavum; vertex corrugato, postice elevato. Palpi fuliginoso cingulati. Oculi plumbei. Prothorax longior quam latior, antice vix angustior, postice spatio magno concavo linea elevata longitudinali instructus; flavus, utrinque lineis obscure fuscis. Alæ elongatæ, subangustatæ, acutæ, anticarum costa vix arcuata; hyalinæ, pterostigmate albido: anticæ macula parva radii basi nigra, venis longitudinalibus albidis, venulis transversalibus fuscisque marginalibus fere omnino nigris: posticæ venis venulisque

plerumque pallidis, harum costalibus, subcostalibus, multis apicem versus dimidioque furcularum nigris. Pedes albid. Abdomen flavo-fuscum (colores mutati); venter ante apicem unguiculis duobus elongatis armatus. (♀.) Long. corp. 7''; exp. alar. 1'' 11''.

Hab. in Australia boreali. In collect. auct.

Antennæ not more than half the length of the wings, thickened beyond the middle, very pale yellow, the apical portion greenish, slightly hairy. *Head* yellow, the vertex corrugated in the middle and elevated posteriorly, a slightly raised flattened plate at the base of each antenna; front with a slightly raised flat transverse space below the antennæ, beyond this space irregularly corrugated; palpi with broad fuliginous rings. *Prothorax* about twice as long as broad, scarcely narrower in front, the sides nearly parallel, yellow, with obscure lateral fuscous lines; the anterior margin rounded; at about a third of its length anteriorly is a transverse impression; the hinder portion bears a large concave space the edges of which are raised, the anterior edge being strongly rounded, and divided in the middle by a raised longitudinal line. *Meso- and metathorax* yellow with a greenish tinge, unspotted, but with several impressed lines and spaces. *Wings* elongate, acute, the costa of the anterior very slightly rounded; hyaline, the pterostigma whitish; *anterior wings* with all the longitudinal veins whitish, almost all the transverse veinlets and marginal forks black, in the subcostal area are several transverse veinlets, those towards the base starting from the subcosta but not reaching the radius, and hence appearing as black dots; a small black spot at the base of the radius: *posterior wings* with the greater part of the veins and veinlets pale, the costal veinlets, many towards the apex, and the apical furcations (for the most part only in their basal half) black. The margins and all the veins and veinlets are strongly hairy in all the wings. *Legs* whitish, hairy, the tarsi somewhat obscure, and the claws brownish. *Abdomen* yellowish fuscous (the colours altered) slender, dilated and laterally compressed at the apex, clothed with fine hairs, the apex obtuse and fringed with long hairs; the seventh abdominal segment beneath is furnished with an extraordinary appendage, consisting of a strong tubercle from the lower edge of which proceed two long bent and incurvated needle-shaped claws reaching nearly to the extremity of the abdomen.

I possess one example, which I have little doubt is a female, from Northern Australia; the wings are broader and more acute than in *sejunctus*, and the prothorax is differently formed.

Genus OSMYLUS, p. 231.

O. CHRYSOPS, p. 232, 1=*O. maculatus*, F. I adopt the Fabrician name, because the Linnean description of *Hemerobius chrysops* cannot apply to this insect, although in his collection it bears the label

"*chrysops*" in his own handwriting. Unfortunately this collection passed through so many hands before it reached its final resting-place, that too great reliance should not be placed on the labels when the insects do not agree with the descriptions.

- O. STRIGATUS, p. 233, 2=*O. strigatus*, Burm. This will not generically agree with *Osmylus*, as was pointed out by Burmeister. Recently Hagen ('*Hemerobiidarum Synopsis Synonymica*') has briefly diagnosed a new genus for its reception, but without name. I propose that of *Porismus*, which may be thus characterized:—

PORISMUS, n. g.

Antennæ moniliformes, alis breviores. Caput parvum, fronte elongato-triangulari. Palpi maxillaris articulis incrassatis. Ocelli tres, approximati. Prothorax elongatus, duplo longior quam lator, antice gradatim angustior. Alæ latæ, apicibus rotundatis: anticæ spatio costali basi dilatato, venulis costalibus transversalibus pernumerosis; subcosta cum radio conjuncta, venulis transversalibus in spatio subcostali numerosis; sectore primo cæteros emittens, ab radio distante sed ad apicem approximato; venis longitudinalibus 5^a et 6^a parallelis, curvatis; venulis transversalibus pernumerosis. Pedes graciles, hirsuti; tarsi articulo primo cæteris longiore; unguiculi simplices; pulvilli magni. Abdomen gracile.

It differs from *Osmylus*, *inter alia*, by its longer and more slender prothorax, and especially in the neururation. In *Osmylus* the first sector runs parallel with the radius, and is separated from it by a small space, whereas in *Porismus* it is distant, excepting at the apex; in *Osmylus* there is only one transverse veinlet, placed at the base of the subcostal area; in *Porismus* there are numerous veinlets, along the whole length of that area; the direction of the 5th and 6th longitudinal veins is also different, and the network generally much closer.

P. strigatus appears to be very common in Australia, judging from the numerous examples I have seen.

- O. VALIDUS, p. 233, 3=*Polystæchotes punctatus*, F. teste Hagen, who states that he has seen the type described by Fabricius in Banks's Museum. I have been unable to find this type. It is singular that Fabricius should, a few years later, have again described an insect so little variable under another name (*Hemerobius nebulosus*).

- O. TENUIS, p. 233, 4. For this insect I propose the generic term *Stenosmylus*; the genus should probably be placed between *Myiodactylus* and *Osmylus*; it possesses the ocelli and antennæ of the latter, but the form of the plantulæ approaches that of the former; the general form is remarkably narrow.

STENOSMYLUS, n. g.

Antennæ moniliformes, alis breviores. Labrum emarginatum. Palpi parvi. Ocelli tres. Prothorax elongatus, subcylindricus. Pedes graciles; plantulæ bifidæ. Alæ elongatæ, angustæ, ad apicem subrotundatæ, aut acutæ; subcosta cum radio conjuncta; sector primus radio parallelus, cæteros emittens; spatium subcostale venula transversali una basali; venulæ subcostales numerosæ; venulæ transversales in disco pernumerossæ.

1. STENOSMYLUS TENUIS, *Walker*.

2. STENOSMYLUS STENOPTERUS, n. sp. Flavo-fuscus. Antennæ pallide flavæ. Caput flavum, vertice fusco quadrivittato, fronte fusco varia. Prothorax flavo-fuscus, nigricante vittatus. Alæ perangustæ, elongatæ, acutæ: anticæ albo-hyalinæ, maculis costalibus apicem versus strigaeque longitudinali in dimidio apicali marginem dorsalem versus fuscis; venis longitudinalibus fusco longitudinaliter striatis, albo interruptis; venulis transversalibus albis, nigro tuberculatis, posticæ hyalinæ, pterostigmate brunneo, venis longitudinalibus fuscis, venulis pterostigmatalibus marginalibusque nigro tuberculatis. Pedes flavi, pilosi; tibiæ et tarsorum articulorum apicibus nigricantibus. Abdomen fuscum; apice incrassato, terebra compressa, sursum incurvata, instructo; infra ante apicem valvulis duabus bifidis instructum. (♀.) Long. corp. 5''-6''; exp. alar. 15'''-20'''.

Hab. in Australia. In Mus. Brit.

Yellowish fuscous. *Antennæ* shorter than the wings, pale yellow, hairy. *Head* yellow; vertex with four fuscous longitudinal stripes; face with fuscous markings; palpi fuscous; ocelli black. *Prothorax* with the length more than twice the breadth, slightly narrowed anteriorly, hairy at the sides; yellowish fuscous, with longitudinal blackish streaks in the middle and at the sides. *Mesothorax* yellowish fuscous, striped with black. *Wings* very narrow, elongate, acute: *anterior wings* whitish hyaline; a fuscous streak from the apex reaches nearly halfway to the base near the dorsal margin; some fuscous spots on the terminal portion of the costal margin; longitudinal veins with long fuscous streaks interrupted by shorter white spaces; costal and marginal veinlets whitish, with numerous thickened black dots; discal veinlets for the most part half black and half white, each with one or two thickened blackish dots in the middle: *posterior wings* hyaline, iridescent; pterostigma brownish, pterostigmatal and marginal veinlets with numerous thickened black dots; longitudinal veins and discal veinlets fuscous, the latter showing a trace of the thickened dots. *Legs* yellow; the tips of the tibiæ and of the tarsal joints blackish fuscous, the terminal tarsal joint wholly fuscous. *Abdomen* fuscous, the apex incrassated and testaceous; at the base of the 6th ventral

segment a large valve, on each side of which is a long straight spine dilated towards the apex; at the apex of the 7th ventral segment a deeply bifid semitransparent valve, the produced points of which are directed towards the base and opposed to the spines on the other valve; between these valves is a deeply concave space; the clavate or thickened portion of the terminal segment is provided with a long sabre-shaped flattened yellow borer, curved upwards.

Three examples, varying much in size, in the collection of the British Museum.

3. *STENOSMYLUS* (?) *LONGIPENNIS*, Walker, vide infra.

O. *CONSPERSUS*, p. 234, 5=*Osmylus conspersus*, Walker. A true *Osmylus*.

O. *LONGIPENNIS*, p. 235, 6. I place this provisionally in *Stenosmylus*; but it is aberrant, and will probably eventually form a new genus.

O. *TUBERCULATUS*, p. 235, 7=*Osmylus tuberculatus*, Walker. Probably a true *Osmylus*.

O. *LONGICORNIS*, p. 235, 8. This is a very aberrant insect, and, from its setaceous antennæ, it should perhaps be placed in the *Chrysopidæ*. Hagen (Neurop. N. America, p. 210) places it provisionally in the uncertain genus *Meleoma*, for want of further information. The type is in bad condition, and I postpone further details on its structure.

Genus *CHRYSOPA*, p. 236.

C. *VITTATA*, p. 237, 1. Under this label are two or three small species very distant from the true *vittata*; the example from Malaga may be *C. microcephala*.

C. *CONGRUA*, p. 238, 2=*C. congrua*, Walker. Allied to *C. vulgaris*, L., but differs in its narrower and more pointed wings, more open neuration, and shorter pubescence.

C. *REMOTA*, p. 238, 3=*C. remota*, Walker. The examples from the different localities present no appreciable differences.

C. *OCEANICA*, p. 238, 4=*C. oceanica*, Walker. Very closely allied to *remota*, but apparently distinct.

C. *BASALIS*, p. 239, 5=*C. basalis*, Walker.

C. *CONCOLOR*, p. 239, 6=*C. congrua*, Walker.

C. *VULGARIS*, p. 239, 7. The one with the label "*vulgaris*" is a much damaged and almost destroyed specimen, apparently *C. alba*; the others are *vulgaris* and *alba*.

C. *INVARIA*, p. 241, 11=*C. invaria*, Walker.

C. *DIVISA*, p. 242, 13=*C. collaris*, Schneider.

- C. ATTENUATA*, p. 242, 14 = *C. attenuata*, Walker.
- C. THORACICA*, p. 243, 15 = *C. thoracica*, Walker. The example shows no trace of the rufous streak on each side of the antennæ mentioned by Hagen in 'Neurop. N. America.'
- C. ALBA*, p. 243, 16 = *C. alba*, L.
- C. REPLETA*, p. 244, 17 = *C. repleta*, Walker.
- C. HYBRIDA*, p. 245, 20 = *C. —?* Not *hybrida* of Schneider.
- C. 4-PUNCTATA*, p. 246, 22, is wanting, nor is there any pin-hole to indicate that it has ever been there.
- C. INFECTA*, p. 246, 23 = *C. infecta*, Newm. Labro antice paulo emarginato; belongs to another section.
- C. CINCTA*, p. 247, 24 = *C. cincta*, Schnd.
- C. NIGRICOSTATA*, p. 250, 34, wanting.
- C. 7-PUNCTATA*, p. 251, 36 = *C. 7-punctata*, Wesm.
- C. INTERMEDIA*, p. 252, 40 = *C. intermedia*, Schnd. (from Santarem). The one without locality is different.
- C. INTERNATA*, p. 252, 41. This equals *C. ampla*, p. 268, 72; and, as the examples of *C. internata* are placed in a wrong section, I think the name *ampla* should be retained.
- C. NIGROVARIA*, p. 253, 42 = *C. nigrovaria*, Walker. The "var. β " is a very different species.
- C. RAMBURII*, p. 254, 43 = *C. Ramburii*, Schnd.
- C. SIGNATA*, p. 254, 44. The example from Van Diemen's Land = *C. Ramburii*; the other is different, but not *signata* of Schneider.
- C. INNOTATA*, p. 254, 45 = *C. innotata*, Walker. Antennar. artic. secund. fuliginoso.
- C. TRANSVERSA*, p. 255, 46 = *C. collaris*, Schneider, var. ?; appears to differ only in the altogether black costal veinlets.
- C. ASPERSA*, p. 256, 48 = *C. aspersa*, Wesm.
- C. ABBREVIATA*, p. 257, 51 = *C. —?* Certainly not *abbreviata*, but more closely allied to *Zelleri*; the example is perhaps not European.
- C. LATIPENNIS*, p. 257, 54 = *C. ypsilon*, Fitch.
- C. CHLOROPHANA*, p. 259, 55 = *C. transmarina*, Hagen, teste Hagen. There are probably two species intermixed; but it belongs to a group in which the differences seem to depend so much upon the presence or absence of one or other of the complicated markings of the head, and are perhaps only accidental, that I decline to give any positive opinion on the examples mentioned by Mr. Walker.

The following citation is omitted in Hagen's 'Hemerob. Synop. synonymica':—*C. illinoiensis*, Shimer, Proc. Ent. Soc. Philadelphia, vol. iv. p. 208 (January 1865), from Illinois.

C. OCCULTA, p. 260, 56 = *C. ypsilon*, Fitch.

C. PERLA, p. 262, 60 = *C. perla*, L.

C. CAPITATA, p. 264, 63 = *C. capitata*, F.

C. FULVICEPS, p. 265, 64 = *C. fulviceps*, Steph.

C. ÆQUALIS, p. 266, 67 = *C. æqualis*, Walker.

C. STIGMATICA, p. 267, 69 = *C. stigmatica*, Rambur.

C. INSIGNIS, p. 267, 70 = *C. insignis*, Walker.

C. VARIA, p. 268, 71 = *C. varia*, Schnd.

C. AMPLA, p. 268, 72 = *C. ampla*, Walker. Closely allied to *C. varia*.

C. INSULARIS, p. 269, 73 = *C. insularis*, Walker. Also allied to *C. varia*, but smaller.

C. CONFORMIS, p. 269, 74 = *C. conformis*, Walker.

C. ANTICA, p. 270, 76 = *C. antica*, Walker. Allied to *C. pallens* of Rambur, and *C. quadarramensis* of Ed. Pictet.

C. DIVERSA, p. 271, 77 = *C. diversa*, Walker.

C. MARIONELLA, p. 271, 78 = *Apochrysa Marionella*, Guérin.

C. AURIFERA, p. 272, 79 = *Apochrysa aurifera*, Walker.

C. LUTEA, p. 273, 80 = *Apochrysa lutea*, Walker.

Genus HEMEROBIUS, p. 276.

H. VIRIDIPENNIS, p. 276, 1 = *Rapisma viridipennis*, Walker. In my description of the genus *Rapisma* (Trans. Ent. Soc. ser. 3, vol. v. p. 353) I have *incorrectly* stated that there is no recurrent venule at the base of the costal area; there is such a venule, but it is not conspicuous.

H. PHALÆNOIDES, p. 277, 2 = *Drepanepteryx phalænoides*, L.

H. BINOCULUS, p. 278, 3 = *Drepanepteryx binoculus*, Newm. This, with *D. instabilis*, M'Lach., and *D. humilis*, M'Lach., is closely allied to *phalænoides*, notwithstanding its distant locality. The presence of a very short transverse veinlet near the end of the subcostal area makes it deceptively appear as if the subcosta and radius became suddenly confluent; a similar veinlet is sometimes found in *D. phalænoides*.

H. FLAVICORNIS, p. 278, 4 = *Berotha flavicornis*, Walker.

H. HAMATUS, p. 278, 5 = *Berotha hamatus*, Walker.

H. MIMICUS, p. 279, 6 = *Psychopsis mimica*, Newm. It is probable that *P. elegans*, Guérin (*Arteriopteryx elegans*, Guérin, 'Icon. p. 389),

is distinct from *P. mimica*, though evidently very closely allied. I have an example which agrees exactly with Guérin's description, and which I had originally placed as possibly a sexual form or variety of *P. mimica*.

H. CÆLIVAGUS, p. 279, 7 = *Psychopsis cælivagus*, Walker.

H. HIRTUS, p. 280, 8 = *Megalomus hirtus*, L.

H. LONGICOLLIS, p. 281, 12 = *Berotha longicollis*, Walker.

H. SUBANTICUS, p. 282, 13 = *Micromus subanticus*, Walker.

H. OBSCURUS, p. 282, 14 = *H. humuli*, L.

H. POSTICUS, p. 283, 15 = *Micromus posticus*, Walker. ♂. Abdominis segmento ultimo ventrali in laminam latam obtusam producto, appendicibus spiniformibus.

This is probably the same as *M. insipidus*, Hagen. I possess four examples from New York.

H. FUSCUS, p. 283, 16 = *H. subnebulosus*, Steph.; vide remarks to *H. nervosus*, infra.

H. SUBNEBULOSUS, p. 284, 17 = *H. subnebulosus*, Steph.

H. PALLIDUS, p. 284, 18 = *H. micans*, Oliv.

H. PELLUCIDUS, p. 284, 19 = *Hemerobius pellucidus*, Dale.

H. NERVOSUS, p. 285, 20. The specimen from Children's collection = *H. humuli*, L.

Under the name of *H. nervosus*, two European species are confounded; they considerably resemble each other, save in the anal appendices, which are strikingly dissimilar. I reserve details for my work on the British *Hemerobiidæ*, but in the meantime diagnose the special characters as under:—

H. NERVOSUS, Fab. et auct. Appendices anales fere regulariter curvatæ. *Hab.* in Europa continent. vulgatissimus, in Anglia aliquanto rarus.

I have seen but few British examples. It is probably the species intended by all continental authors. For the other I use the name

H. SUBNEBULOSUS, Stephens. Appendices anales elongatæ, latæ, rectæ; apicibus truncatis, dilatatis, infra spina elongata, curvata, ad apicem extus unidentata instructis.

Hab. in Anglia vulgatissimus.

I have not seen a continental example of this, nor is it known as such by Dr. Hagen.

The types of *subnebulosus* (in part), *humuli*, *fuscus*, and *nervosus* of Stephens's "Illustrations" are this species, which is exceedingly abundant in Britain, and very variable.

- H. NEBULOSUS*, p. 285, 21 = *H. limbatus*, Wesm.
- H. SIMULANS*, p. 285, 22 = *H. simulans*, Walker.
- H. MARGINATUS*, p. 286, 23. The Nova-Scotian example is a female; it does not appear to differ from the European *H. marginatus*, Steph. (*fervosus*, Hag.).
- H. HUMULI*, p. 286, 24. The English example = *H. humuli*, L. I am not sure if the American insect be distinct; in general appearance it is precisely like the European, but may perhaps differ in the appendices; I possess several examples from New York.
- H. PERELEGANS*, p. 287, 25. Both examples are in Stephens's collection, and = *H. limbatus*, Wesm., dark vars.
- H. LUTESCENS*, p. 287, 26. The British example = *H. humuli*, L.; the one from Children's collection is very different, and doubtful, being in bad condition.
- H. AFFINIS*, p. 287, 27 = *H. humuli*, L.
- H. PAGANUS*, p. 287, 28 = *H. humuli*, L.
- H. APICALIS*, p. 288, 29 = *H. humuli*, L.
- H. PUNCTATUS*, p. 288, 30 = *H. micans*, Oliv.
- H. CRISPUS*, p. 288, 31 = *H. limbatus*, Wesm. The American examples do not essentially differ from the European, and have similar appendices.
- H. STIGMA*, p. 288, 32 = *H. limbatus*, Wesm.
- H. MARSHAMI*, p. 289, 34 = *H. elegans*, Steph. (*pygmæus*, Rambur).
- H. OBLITERATUS*, 289, 35. The specimen immature; apparently the same as *crispus* (*limbatus*).
- H. AUSTRALIS*, p. 289, 36 = *H. australis*, Walker. Closely allied to *humuli*.
- H. VARIEGATUS*, p. 290, 37 = *Micromus variegatus*, F.
- H. CONCINNUS*, p. 290, 38 = *H. concinnus*, Steph. (*lutescens*, F.; *cylindripes*, Wesm.).
- H. PINI*, p. 291, 39 = *H. limbatus*, Wesm.
- H. LONGIFRONS*, p. 291, 40 = *H. longifrons*, Walker. This is a remarkable insect, with the facies of *H. nervosus*, but with broader and more obtuse wings, and very distinct. In my European collection I have three examples, received from Prof. Zeller, which do not appear to be different from the American: the latter has four sectors, and my European insect, as a rule, only three; but one specimen has three in one fore wing, and four in the other; the legs are entirely pale in the American, but sometimes varied with fuscous in the European. All

the individuals are females, which sex is remarkable for the possession of a broad elongated flattened borer at the apex of the abdomen, indicating some peculiar habit. I subjoin a more correct and detailed description :—

HEMEROBIUS LONGIFRONS, *Walker*. Nigro-fuscus, vitta dorsali ferrugineo-fusca. Antennæ flavæ, apice obscuriore. Frons nitente piceo-nigra. Alæ latæ, obtusæ: anticæ albido-hyalinæ, fuliginoso nebulosæ; fasciis transversis tribus nigro-fuscis; venis venulisque albis, confertim nigro punctatis striatisque; venulis gradatis externe 7-8 valde irregularibus, interne 6-7, et ad basin 4, omnino nigris; sectoribus 3 vel 4: posticæ hyalinæ, venis venulisque nigris. Pedes pallide flavi; in exemp. Europ. tibiis aliquando inconspicue fusco notatis, femoribus posterioribus in parte fuscis. Abdomen nigro-fuscum, terebra lata, elongata, depressa, acutiuscula instructum. (♀.) Long. corp. 3-4''; exp. alar. 9-10''.

Hab. in Hudson's Bay, America boreali (*Barnston*); Europa (Spitzberg, Silesia, Bameralp, Steyermark) (*Zeller*) 4 ♀.

H. FASCIATUS, p. 291, 41 = *H. limbatus*, Wesm. In Stephens's coll.

H. FUSCATUS, p. 296, 60 = *Sisyrha fuscata*, F.

H. NITIDULUS, p. 296, 61 = *Sisyrha Dalii*, M'Lach.

H. CONFINIS, p. 297, 62 = *Sisyrha fuscata*, F.

H. VICARIUS, p. 397, 65 = *Sisyrha vicaria*, Walker.

Note.—The genus *Dromophila*, inserted at p. 298, belongs to the Trichoptera; and *D. montana* = *Enoicyla pusilla*, Burmeister, ♀.

Genus CONIORTES, p. 208.

All the examples noted by Walker are in Stephens's collection, and the nomenclature is that of the 'Illustrations' of that author. *Coniortes*, Westwood = *Coniopteryx*, Haliday.

Family MYRMELEONIDÆ.

Genus MYRMELEON, p. 300.

In my examination of the enormous number of species under this head (ninety-eight are described as new by Mr. Walker), I have endeavoured to fix them in the limits of the generic synopsis given by Hagen in his 'Hemerobiidarum Synopsis Synonymica.' Walker places them in sections; but the species in many instances do not accord with his subdivisions. It will be necessary that at some future time an extensive splitting up of some of Hagen's genera shall be made. *Palpares* is for the most part very homo-

geneous; yet *P. gigas* and its allies seem to form a genus apart, and I have in this paper (*ante*, p. 243) proposed a generic term for *P. hæmatogaster*. *Stenares* forms a natural group. *Pamexis* is also natural; yet *M. pardalinus* of Walker might be placed either here or in *Palpares*. *Tomateres* is to a certain extent made up of nearly allied forms, but their relationship to *Palpares* is close. *Dimares* is very natural. *Stilbopteryx* differs widely from any other group. *Acanthaclisis* is made up of species with a particular facies, yet contains well-marked groups, *A. horridus* and *A. fallax* being especially aberrant. The words in Hagen's diagnosis, "calcaribus fractis" only hold good for a portion of the species; in the rest the spurs are regularly curved. *Glenurus* is especially heterogeneous, and stands greatly in need of redivision: the Australian species, and especially *G. erythrocephalus*, have little in common with the others. *Creagris* is apparently natural. *Gymnocnemis* comprises very few species, which readily fall into one genus. *Mecistopus* should probably be only retained for the typical species; the South American *M. efferus* and *M. prædator* are aberrant. *Formicaleo* is tolerably natural, but should perhaps include some species placed in *Glenurus*. *Myrmecælurus* should be retained for *M. trigrammus* and its near allies, which alone possess the character "abdomen maris ante apicem penicillatum;" the other species are aberrant. *Macronemurus* seems to be natural. *Myrmeleon*, if regarded as a group distinguished by the spurs not exceeding the first tarsal joint, is tolerably homogeneous, yet it contains discordant materials when viewed from other points.

The number of species of *Myrmeleon*, in the old sense, will probably be eventually found to exceed 500; and it is evident that in such a mass very many generic forms must exist. It remains for a monographer to sift this mass; until then I fear that a natural classification of the *Myrmeleonidæ* cannot be looked for, and we must be content to improve upon the generic groundwork laid down by Hagen.

M. GIGAS, p. 301, 1 = *Palpares gigas*, Dalm.

M. CONTRARIUS, p. 301, 2 = *Palpares contrarius*, Walker.

M. SOLLICITUS, p. 302, 3 = *Palpares cephalotes*, Klug, ♀. This insect was taken during the exploring voyage of the 'Blonde;' but no locality is mentioned. Hagen (Stett. Ent. Zeit. 1860, pp. 360-361) thinks it may be from the Society Islands. This I conceive to be impossible, and consider it African or Arabian. The specimen agrees perfectly with Klug's figures (Symb. Phys.) of his *cephalotes*.

- M. INCLEMENS, p. 303, 4 = *Palpares inclemens*, Walker, ♀.
- M. CEPHALOTES, p. 304, 5. This is probably the *cephalotes* of Rambur; but I doubt much if it be identical with Klug's species; only males are in the collection, and there is a possibility that *P. inclemens* may be the female of it.
- M. FURFURACEUS, p. 305, 6. The same as those under *cephalotes*, but slightly differing in the markings.
- M. PATIENS, p. 305, 7 = *Palpares patiens*, Walker.
- M. LIBELLULOIDES, p. 305, 8 = *Palpares libelluloides*, L. One of the specimens from Tunis is *P. hispanus*, Hagen.
- M. SPECIOSUS, p. 306, 9. For the most part *Palpares speciosus*, L.; but four examples are *P. caffer*, Burm.
- M. TIGRIS, p. 307, 10 =, I think, certainly *Palpares manicatus* of Rambur, and very probably the true *tigris* of Dalman.
- M. INFIMUS, p. 307, 11 = *Palpares infimus*, Walker.
- M. PARDUS p. 308, 12 = *Palpares pardus*, Rambur.
- M. SUBDUCENS, p. 308, 13 = *Palpares cephalotes*, Klug. This insect is from the voyage of the 'Blonde,' and differs only very slightly in markings from that described as *sollicitus*.
- M. INCOMMODUS, p. 309, 14 = *Palpares incommodus*, Walker.
- M. ZEBRATUS, p. 310, 15. According to Hagen (Stett. Ent. Zeit. 1860) this is not the same as *zebratus* of Rambur: the description of the latter seems to me to agree with Walker's insect, excepting some slight variation in the markings of the posterior wings.
- M. EXPERTUS, p. 311, 16 = *Palpares pardus*, Rambur.
- M. PARDALINUS, p. 314, 26. This I think cannot be the same as *M. pardalinus* of Burmeister, which seems to me to be a *Pamexis*, closely allied to *conspurcatus*. Walker's insect has the form of *Pamexis*, but wants the pulverulent appearance of those insects. I call it provisionally *Palpares ? brachypterus*.
- M. OCCITANICUS, p. 315, 28 = *Acanthaclisis occitanica*, Vill. *Calcaribus abrupte inflexis*; *area costali biareolata*.
- M. DISTINCTUS, p. 316, 30, var. ? According to Hagen not the species of Rambur. *Calcaribus abrupte inflexis*; *area costali uniareolata*.
- M. EDAX, p. 317, 32. According to Hagen = *gulo*, Burm.; the specimens have been in alcohol, and are much altered in the coloration of the body. *Calcaribus abrupte inflexis*; *area costali uniareolata*.
- M. LONGICOLLIS, var. ?, p. 318, 34. Not Rambur's species. *Calcaribus abrupte inflexis*; *area costali biareolata*.

M. FUNDATUS, p. 320, 36=*Acanthaclisis fundata*, Walker. Calcaribus regulariter curvatis; area costali biareolata.

M. SUBTENDENS, p. 321, 37=*Acanthaclisis subtendens*, Walker. Calcaribus regulariter curvatis; area costali biareolata.

M. MOLESTUS, p. 322, 38. The same as *Acanthaclisis distincta*, Walker.

M. FERALIS, p. 322, 39=*Acanthaclisis feralis*, Walker. Calcaribus abrupte inflexis; area costali uniareolata.

M. FERUS, p. 323, 40=*Acanthaclisis atra*, Fab., teste exemp. typ. in collect. Banks. Calcaribus regulariter curvatis; area costali uniareolata.

M. IMPOSTOR, p. 324, 41=*Acanthaclisis fallax*, Ramb. Calcaribus regulariter curvatis; alis latioribus, area costali plerumque biareolata, venulis irregularibus.

M. PERITUS, p. 325, 42=*Stenares hyæna*, Dalman.

M. IMPROBUS, p. 326, 43=*Stenares improbus*, Walker.

M. INCLUSUS, p. 327, 44=*Acanthaclisis inclusa*, Walker. Calcaribus regulariter curvatis; alis latioribus, area costali plerumque biareolata, venulis irregularibus.

M. LONGICAUDUS, p. 329, 46=*Macronemurus abdominalis*, Say. There appears to be some confusion about this species and the next. In Hagen's 'Neurop. N. Amer.' p. 226, *abdominalis* is said to have "no spurs;" in his 'Hemerob. Synop. Synonym.' it is placed in *Macronemurus*, to which genus Walker's species undoubtedly belongs; and *longicaudus* of Burmeister is placed in *Myrmeleon*, in its limited sense. I believe that Hagen possesses Burmeister's type, and I cannot unravel the perplexity.

M. CONSPERSUS, 329, 47=*Macronemurus irroratus*, Rambur. In the 'Neurop. N. Amer.' both *irroratus* and *conspersus* are given as synonyms of *abdominalis*.

M. NEBULOSUS, p. 330, 48=*Macronemurus nebulosus*, Rambur?

M. INIQUUS, p. 330, 49=*Macronemurus iniquus*, Walker.

M. IMMITIS, p. 331, 50=*Macronemurus immitis*, Walker.

M. VERSUTUS, p. 331, 51=*Macronemurus versutus*, Walker.

M. FEROX, p. 332, 52=*Macronemurus ferox*, Walker.

M. ANOMALUS, p. 333, 54=*Glenurus anomalus*, Rambur. Walker queries the determination; but the insect seems to agree perfectly with Rambur's description.

M. TETRAGRAMMICUS, p. 335, 59=*Formicaleo tetragrammicus*, Pall.

M. HORRIDUS, p. 336, 61=*Acanthaclisis horridus*, Walker. Calcaribus

bus valde curvatis; alis latis; area costali uniareolata. This is a very abnormal species of the genus.

M. PERICULOSUS, p. 337, 62=*Myrmeleon periculosus*, Walker. Calcaribus artic. tar. 1^a æqualibus.

M. INGENIOSUS, 337, 63=*Formicaleo ingeniosus*, Walker.

M. AUDAX, p. 338, 64=*Formicaleo audax*, Walker.

M. GRAVIS, p. 339, 65=*Formicaleo gravis*, Walker.

M. STRIOLA, p. 340, 66=*Formicaleo striola*, Leach. A species very widely distributed; I possess it from the Fiji Islands. It is probable that *M. bistrigatus*, Rambur, is only a strongly marked form, and that Rambur's name should be retained, that of Leach being only in M.S.; the description is by Walker.

M. PERJURUS, p. 340, 67=*Formicaleo striola*, Leach.

M. TORVUS, p. 341, 68. Not to be separated from *F. striola*, and identical therewith; the wings seem slightly narrower.

M. VERENDUS, p. 342, 69=*Formicaleo verendus*, Walker.

M. VESANUS, p. 343, 70=*Formicaleo vesanus*, Walker.

M. MINAX, p. 343, 71=*Formicaleo verendus*, Walker.

M. PUGNAX, p. 344, 72=*Formicaleo pugnax*, Walker. Perhaps=*M. mustelinum*, F.

M. VAFER, p. 345, 73=*Formicaleo vafer*, Walker.

M. DIRUS, p. 346, 74=*Formicaleo dirus*, Walker.

M. LENTUS, p. 346, 75=*Formicaleo dirus*, Walker.

M. TRUCULENTUS, p. 347, 76=*Formicaleo truculentus*, Walker.

M. VIOLENTUS, p. 348, 77=*Formicaleo striola*, Leach. A variety without the dark line in the apex of the posterior wings: one example of *perjurus* (*vide supra*) shows only a slight trace of this line.

M. ACER, p. 348, 78=*Myrmeleon acer*, Walker.

M. CAUTUS, p. 349, 79=*Formicaleo cautus*, Walker.

M. DURUS, p. 350, 80=*Formicaleo durus*, Walker. The example has been in spirits, and its original form is not recognizable.

M. PERFIDUS, p. 350, 81=*Creagris perfidus*, Walker. Closely allied to the European *C. plumbeus*.

M. INSIDIOSUS, p. 350, 82=*Macronemurus appendiculatus*, Lat.

M. V-NIGRUM? p. 351, 84. This closely agrees with Rambur's description of his European *v-nigrum*, but can scarcely be the same species. It is identical with *Creagris mortifer*, Walker.

- M. PALLIDIPENNIS, p. 352, 85 = *Creagris plumbeus*, Oliv.
- M. AFRICANUS, p. 352, 86 = *Creagris africanus*, Rambur. Scarcely distinct from *C. plumbeus*.
- M. MORTIFER, p. 353, 88 = *Creagris mortifer*, Walker.
- M. PERVIGIL, p. 354, 89 = *Creagris mortifer*, Walker.
- M. SEDULUS, p. 355, 90 = *Creagris perfidus*, Walker.
- M. LUGDUNIENSIS, p. 355, 91 = *Creagris plumbeus*, Oliv.
- M. APPENDICULATUS, p. 356, 93 = *Macronemurus appendiculatus*, Lat.
- M. INFESTUS, p. 357, 94 = *Glenurus infestus*, Walker.
- M. NEFANDUS, p. 357, 95 = *Macronemurus nefandus*, Walker.
- M. ADVERSUS, p. 358, 96 = *Creagris perfidus*, Walker.
- M. BARBARUS, p. 358, 97 = *Macronemurus barbarus*, Walker.
- M. DESPERATUS, p. 359, 98 = *Formicaleo vafer*, Walker.
- M. PERNICIOSUS, p. 360, 99 = *Formicaleo vafer*, Walker.
- M. ABDITUS, p. 360, 100 = *Macronemurus abditus*, Walker.
- M. NIGROCINCTUS? p. 361, 101 = *Glenurus obsoletus*, Say. I believe the locality "Australia" to be an error.
- M. TACITUS, p. 362, 102 = *Glenurus tacitus*, Walker.
- M. FLAVUS, p. 363, 103 = *Myrmecælurus trigrammus*, Pallas.
- M. TAPPA, p. 364, 107 = *Formicaleo Tappa*, Walker. Perhaps the ♀ of *vesanus*; the tibiæ distinctly fasciated.
- M. MALEFIDUS, p. 364, 108 = *Formicaleo vafer*, Walker.
- M. INFIDUS, p. 365, 109 = *Myrmecælurus infidus*, Walker.
- M. ACERBUS, p. 366, 110 = *Myrmecælurus acerbus*, Walker. Closely allied to *M. trigrammus*, differs in the subcosta being black, interrupted with yellow, the radius wholly black, and some of the other veins also black.
- M. MENDAX, p. 366, 111 = *Myrmecælurus mendax*, Walker.
- M. SOLERS, p. 367, 112 = *Myrmecælurus solers*, Walker.
- M. FORMICARIUS, p. 368, 113 = *Myrmeleon formicarius*, L.
- M. INOPINUS, p. 368, 114 = *Myrmeleon inopinus*, Walker.
- M. LANCEOLATUS, p. 369, 115 = *Myrmeleon lanceolatus*, Rambur.
- M. NOTATUS, p. 369, 116 = *Megistopus flavicornis*, Rossi.

- M. INNOTATUS, p. 371, 123 = *Myrmeleon formicalynx*, L. Teste exemp. typ. in collect. Linn.
- M. INCONSPICUUS, p. 372, 125 = *Myrmeleon Leachii*, Guilding.
- M. LEACHII, p. 373, 127 = *Myrmeleon Leachii*, Guilding.
- M. TRISTIS, p. 373, 128 = *Myrmeleon tristis*, Walker.
- M. LETHALIS, p. 374, 129 = *Myrmeleon lethalis*, Walker, *i. e.* the specimen bearing the label "*lethalis*;" the other two are very different and = *Formicaleo leucospilos*, Hagen.
- M. LETHIFER, p. 374, 130 = *Myrmeleon lethifer*, Walker.
- M. SECRETUS, p. 375, 131 = *Myrmeleon alternans*, Brullé. The specimen is smaller than examples of *alternans* taken by Wollaston in Madeira, and the markings of the head differ very slightly.
- M. IMPLEXUS, p. 376, 132 = *Myrmecaelurus implexus*, Walker.
- M. EXITIALIS, p. 376, 133 = *Myrmeleon exitialis*, Walker.
- M. ACUTUS, p. 377, 134 = *Myrmeleon acutus*, Walker.
- M. TECTUS, p. 378, 135 = *Myrmeleon tectus*, Walker. Doubtfully distinct from *M. immaculatus*, D. G., Hagen.
- M. ASPER, p. 378, 136 = *Myrmeleon asper*, Walker.
- M. INVISUS, p. 379, 137 = *Myrmeleon asper*, Walker.
- M. MALIGNUS, p. 380, 138 = *Myrmeleon malignus*, Walker.
- M. FICTUS, p. 380, 139 = *Myrmeleon malignus*, Walker.
- M. IMMANIS, p. 381, 140 = *Myrmeleon immanis*, Walker.
- M. SÆVUS, p. 381, 141 = *Myrmeleon sævus*, Walker. Closely allied to *M. punctatus*, F., teste exemp. typ. in coll. Banks, but with a differently shaped prothorax.
- M. punctatus* is said to inhabit "India orientalis;" but I know no species thence which will agree with Fabricius's type. It is well known that the localities in the old authors are rather uncertain; and I believe that *M. punctatus* comes from South Africa. I have an example from that quarter, which is specifically identical with the type.

The following is a description of it:—

MYRMELEON PUNCTATUS, *Fab.*

Flavus, nigro vittatus. Antennæ fuscæ, indistincte pallide annulatæ, articulo basali in fronte flavo semicincto; clava subtus ochracea. Caput flavum, inter antennis late nigrum; occipite vitta media punctisque quatuor nigris; fronte macula media piceo-nigra; palpis flavis, arti-

culo ultimo fere toto piceo-nigro, valde acuminato. Prothorax elongatus, antice angustior, flavus, supra nigro trivittatus. Mesothorax flavus; supra vitta media, duabusque lateralibus subinterruptis, nigris. Pectus flavum, utrinque nigro bivittatum. Alæ elongatæ, acutæ, fere æquales; pterostigmate fere quadrato, rufo-ochraceo; venis venulisque nigris, flavo-albido interruptis; punctis numerosis in fureularum axillis nigris. Pedes flavi; femoribus nigro punctatis; tibiis anticis intermediisque nigro fasciatis et punctatis; tarsis brunneo annulatis. Abdomen flavum; vittis quinque, quarum una dorsali, duabus utrinque, nigris. Long. corp. 1" 3''' ; exp. alar. 2" 10'''.

M. SAGAX, p. 382, 142 = *Myrmeleon sagax*, Walker.

M. INFENSUS, p. 383, 143 = *Myrmeleon infensus*, Walker. Perhaps only a var. of *sævus*.

M. DOLOSUS, p. 383, 144 = *Myrmeleon dolosus*, Walker.

M. HOSTILIS, p. 384, 145 = *Myrmeleon hostilis*, Walker.

M. CALLIDUS, p. 384, 146 = *Macronemurus callidus*, Walker.

M. INSOMNIS, p. 385, 147 = *Formicaleo insomnis*, Walker.

M. OCCULTUS, p. 386, 148 = *Gymnocnemis occulta*, Walker.

M. METUENDUS, p. 387, 149 = *Myrmeleon metuendus*, Walker.

M. EFFERUS, p. 387, 150 = *Megistopus efferus*, Walker.

M. EXSANGUIS, p. 387, 151 = *Myrmeleon exsanguis*, Walker.

M. CRUDELIS, p. 388, 152 = *Myrmeleon crudelis*, Walker. Hagen ('Neurop. N. Amer.') queries his *rusticus* as identical with *crudelis*; his description of the former does not agree with Walker's species.

M. MOROSUS, p. 389, 153 = *Myrmeleon morosus*, Walker.

M. ATROX, p. 390, 154 = *Myrmecaelurus atrox*, Walker. Seems to be intermediate between *M. trigrammus* and *M. acerbus*.

M. INERS, p. 390, 155 = *Myrmecaelurus atrox*, Walker. Immature.

M. PRÆDATOR, p. 391, 156 = *Megistopus prædator*, Walker. Closely allied to *M. efferus* and doubtfully distinct.

M. GRATUS, p. 392, 157 = *Glenurus gratus*, Say.

M. PULCHELLUS, p. 392, 158 = *Glenurus pulchellus*, Rambur.

M. FALSUS, p. 393, 159 = *Glenurus falsus*, Walker.

M. MALUS, p. 393, 160 = *Gymnocnemis mala*, Walker.

M. ERYTHROCEPHALUS, p. 394, 161 = *Glenurus? erythrocephalus*, Leach. This species comes very unsatisfactorily in *Glenurus*, which, in itself, contains several generic forms.

M. SUBDOLUS, p. 395, 164 = *Dimares subdolus*, Walker. Hagen ('Stett. ent. Zeit.' 1860) queries this as distinct from *elegans* of Perty; but I believe the two species are thoroughly good. *M. conicollis* of Walker ('Trans. Ent. Soc. Lond.' ser. 2. vol. v. p. 188) is certainly *D. elegans*: this latter species is very liable to vary; for many specimens are entirely without the markings on the wings, and in these the normal dark reticulation is interrupted by pale spaces.

M. COMPOSITUS, p. 397, 166 = *Tomateres pardalis*, F. Teste exemp. typ. in collect. Banks.

M. ASTUTUS, 398, 167 = *Tomateres astutus*, Walker.

M. TRANSLATUS, p. 398, 168 = *Pamexis conspurcatus*, Burm.

M. SINGULARIS, p. 399, 170 = *Glenurus singularis*, Westw.

M. CIRCUITER, p. 400, 171 = *Glenurus circuiter*, Walker.

EXPLANATION OF PLATE VIII.

Fig. 1. *Corydalis Batesii*, ♀.

2. *Corydalis crassicornis*, ♂; 2 *a*, portion of antenna; 2 *b*, anal appendices (side view); 2 *c*, ditto (from above).

3. *Corydalis inamabilis*, ♂; 3 *a*, portion of antenna; 3 *b*, anal appendices (side view); 3 *c*, ditto (from above).

ERRATA.

Page 237, line 12 from top, for "apex" read "radius."

Page 253, line 13 from top, *dele* "dimidio et ultra."

On the Prevalence of Entozoa in the Dog, with Remarks on their Relation to Public Health. By T. S. COBBOLD, M.D., F.R.S., F.L.S., Lecturer on Zoology, &c.

[Read April 18, 1867.]

DESPITE the rapid advances of heminthological science, it is not yet sufficiently well understood how intimately connected are the relations subsisting between man and the domestic animals in reference to entozootic diseases. Whilst our very existence is dependent upon a supply of certain animals, as sources of food and aids to civilization, it can nevertheless be shown that under certain circumstances any one of the most valued of our domestic quadrupeds may become an occasion of discomfort, disease, or even death. The truth of this general statement is sufficiently

obvious in cases of ordinary accident, and also in those diseases (hydrophobia for example), whose nature is either doubtful, or which, at the least, cannot be said to have a parasitic origin; but it comes out much more forcibly when we confine our attention exclusively to evils arising from entozoa harboured by our domesticated animals in their capacity as "intermediary bearers." In this communication I select the Dog as pointedly illustrating the correctness of the proposition just advanced; but, at the same time, I may add that, excepting perhaps the equine quadrupeds, I know of no important domestic animal which is not liable, by the agency of its parasites, to inflict on the human body one or other of the injuries just referred to—namely discomfort, disease, or death.

I may be permitted also to remark at the outset that all our researches, and especially those of the experimental kind, tend to show how the evils just mentioned may be averted; and many of our investigations having, in the first instance, a purely scientific object have materially strengthened the results obtained by other researches having merely a practical aim. It may be said that the two methods should go hand in hand, or, at least, *pari passu*, in order to ensure brilliant results. Already helminthologists have obtained a considerable success; but it is just one of those successes in which the principal promoters are left without reward. Self-imposed tasks of this kind are more or less the prerogative of all the votaries of science, who, at least, have the satisfaction of knowing that they contribute to the public good.

To simplify and limit the subject matter before us, I offer, at once, a complete and revised list of all the entozoa (species, varieties, and larvæ) at present known to infest the dog. In many respects it is interesting to contrast this, as a whole, with the rather more extended list of human entozoa which I have previously communicated to the Zoological Society; but, as will hereafter be seen, the mutual relations subsisting between certain members of the two series can only be established by a somewhat detailed notice respecting the individual forms. These are as follows:—

1. *Holostoma alatum*, Nitzsch.
2. *Spiroptera sanguinolenta*, Rudolphi.
3. *Dochmius trigenocephalus*, Dujardin.
4. *Trichosoma plica*, Rudolphi.
5. *Trichocephalus depressiusculus*, Rudolphi.
6. *Trichina spiralis*, Owen.

7. *Ascaris marginata*, Rudolphi.
8. *Eustrongylus gigas*, Diesing.
9. *Bothriocephalus latus*, Bremser.
10. *B. cordatus*, Leuckart.
11. *B. fuscus*, Krabbe.
 - „ „ var. *reticulatus*, Krabbe.
 - „ „ var. *dubius*, Krabbe.
12. *Tænia marginata*, Batsch.
13. *T. cænurus*, Kuchenmeister.
14. *T. cucumerina*, Bloch.
15. *T. serrata*, Goeze.
16. *T. litterata*, Batsch.
17. *T. echinococcus*, Siebold.
18. *Pentastoma tænioides*, Rudolphi.
19. *Cysticercus (telæ) cellulosæ* } larval forms.
20. *Filaria trispinulosa* }
21. *F. sanguinis* }

The above list, large as it is, might be very much extended if one chose to regard as true species a number of particular forms and varieties described by authors under other names. I could show, however (if it were the express object of the present paper to do so), that most, if not all, of the forms referred to are in point of fact identical with those here provisionally admitted to be distinct. Probably the list is somewhat too extended as it is; yet, meanwhile, I purposely refrain from entering at any length upon the exclusively zoological aspects of the question. In other words, I wish it to be understood that, as regards several of the forms here enumerated, I do not pledge myself to affirm that they are specifically distinct. Nevertheless, taking them up serially in the order given, I have a few remarks to offer respecting each; and fortunately the end proposed will enable me to restrict my observations on certain forms within the narrowest possible limits.

1. *Holostoma alatum*.—Flukes are sparingly found in the carnivorous mammalia generally; therefore the Trematoda being represented by a single species in the dog need not excite surprise. Though rare in the dog, this fluke is not uncommon in its congeners, the Fox and Wolf. Under a variety of names its structure and relations have been carefully studied; but there is no ground for supposing that its existence is either directly or indirectly injurious to man.

2. *Spiroptera sanguinolenta*.—I am not aware that any one has

distinctly indicated the presence of this parasite in dogs dying or destroyed in this country; but it appears to be tolerably frequent in France and Germany. I believe it to be identical with the round-worm, which is known to be common in China and not unfrequently to cause the sudden death of its canine host. Some years ago a manuscript was placed in my hands, giving a detailed account of the ravages inflicted by these parasites; but I fear the paper has been irretrievably lost. Dr. Hughes Bennett, of Edinburgh, has in his possession a Chinese dog's heart which had burst during life from the pressure occasioned by a large number of these parasites lodged in the ventricles. In the year 1813 a round worm, probably referable to this species, was found in the heart of a dog at Paris; and there is some probability that the microscopic hæmatozoa, first discovered by Grube and Delafond in the blood of dogs, are genetically related to this species. I shall again have occasion to remark upon this point*.

3. *Dochmius trigenocephalus*.—This small parasite is probably not uncommon in this country, but it is either frequently overlooked or disregarded on account of its apparent unimportance. It is not likely that the migrating progeny are the source of the verminiferous condition of the blood just alluded to. Its prevalence is certainly very variable in different countries or districts; but the only accurate observations bearing upon this point are those given by Dr. Krabbe in his recent Danish work†. Out of 500 dogs which he had examined (after death) at the Royal Veterinary and Agricultural College at Copenhagen, only nine contained this parasite, whilst in 100 dogs dissected in Iceland it was entirely wanting. His experience, as regards its prevalence in other members of the canine race, coincides with that of ob-

* Since this paper was announced I have received a letter from Dr. Jones Lamprey (Surg. 67th Reg.), confirming the facts above mentioned. Writing on the 15th inst., he says:—"I take the liberty to inform you that I have found some remarkable entozoa in the cavities of the hearts of dogs in China, which I have sent to the Museum of the Army Medical Department at Netley, together with an account of them. I do not believe they have been, as yet, described." I (Dr. C.) may also add that since this paper was read I have reexamined Prof. Bennett's preparation, and, by his permission, have removed and retained one of the parasites. It measures exactly 10 inches in length.—T. S. C.

† Helminthologiske Undersøgelser i Danmark og paa Island, med særligt Hensyn til Blæreormlidelserne paa Island. Af Dr. med. Krabbe. Kjøbenhavn, 1865. [The above facts are taken from the Danish work; but Dr. Krabbe has since brought out a French edition of his treatise, and has likewise, through M. Blanchard, communicated a résumé of his researches to the French Academy.—T. S. C.]

servers generally ; for he found this entozoon in three Danish foxes, and also in a blue or Arctic fox (*Canis lagopus*) which died in Dr. Kjærbolling's menagerie. It is worthy of remark that the last-named animal had originally come from Iceland. The importance of noticing these particulars and of indicating all the rarer forms of canine entozoa will appear in the sequel.

4. *Trichosoma plica*.—This parasite, like the previous species, is much more common in the fox than in the dog ; but the possibility of its occurrence in the latter should be born in mind. So far as I am aware, the only direct proof we have of its liability to infest the dog rests upon the statements of Dr. Bellingham. The circumstance of its not inhabiting the alimentary canal will readily account for its not having been often seen although it should afterward turn out to be comparatively frequent in occurrence. The organization of the species has been sufficiently well investigated by Rayer ; but its precise genetic relations remain to be cleared up. It is by no means improbable that the progeny of the preceding species, as well as of this entozoon and of the form next to be noticed, passes through phases of development closely resembling those of *Trichina*. Thus it may happen that an inexperienced observer finding these larvæ, in the act of migrating, in the flesh of any "host" might be induced to conclude that he had discovered examples of the fleshworm-disease, when in truth he had only encountered the offspring of parasites totally distinct. Mistakes of this kind have occurred over and over again in reference to a minute and little-known parasite which infests the cat ; and doubtless nearly all the sexually immature forms of parasites described as new species by their respective discoverers are the offspring only of some of their more or less familiarly known representatives.

5. *Trichocephalus depressiusculus*.—This parasite is likewise common to the dog and fox, and, though on the whole more prevalent in the former, cannot be said to be frequent in either. I have only seen one or two examples. Out of 144 dogs dissected at Vienna it was only noticed four times ; and in sixty-two foxes examined at the same place, not one was encountered. On the other hand, Dujardin found this species present in two out of seven foxes dissected by him at Rennes. It does not appear to have come under Dr. Krabbe's observation in any of the 600 dogs which he examined in Denmark and Iceland. I regret that I retain no accurate data respecting the prevalence of this and several other of the less frequent parasitic forms which I have

encountered from time to time in dogs. Until lately the value of such peculiar statistical records, in reference to our domestic animals, did not fully strike me; but from 1855 to 1864 inclusive I noted down all the parasites encountered in less common "hosts." Part of the fragmentary results thus obtained I have already communicated to the Zoological Society*.

6. *Trichina spiralis*.—This interesting parasite is probably not indigenous, so to speak, in the dog; but the ease with which it may be transmitted, and the frequency of its introduction by experiment, oblige us now to class the fleshworm with other canine entozoa. Until lately it was supposed that *Trichina* might be made to infest any warm-blooded animal; but recent experiments (conducted by Mr. Simonds and myself at the Royal Veterinary College in London, and on a more extended scale by Drs. Pagenstecher and Fuchs at the Zoological Institute at Heidelberg) incontestably prove that the fleshworm, as such, cannot be reared in birds. Having already offered a detailed account of these experiments to the Society, it is only necessary that I should remark that I have repeatedly reared *Trichinæ* in the dog from the flesh of man and animals. Except in a very indirect manner, the dog itself is scarcely likely to communicate the fleshworm disease to man; nevertheless if the flesh of a trichinized dog were eaten by us, the malady would be readily propagated. There would moreover be considerable danger in allowing trichinized dogs to roam at large; for the consumption of their flesh (after death) by other animals, such as rats, for example, would convey the disorder to new "hosts," which again might convey it to the pig, and ultimately to man. It has, indeed, been fully proved that in some instances swine have been infected by eating dead rats and the decomposing remains of other trichinized animals; and it is quite certain that rats, not previously made the subject of experiment, have been found to contain *Trichinæ* in their muscles. Dr. Krabbe informs me, by letter, that he has discovered trichinized rats in Copenhagen; and the same thing has been noticed in Germany. Dogs and cats alike may also become infected from this source. Bearing in mind, therefore, the variety of sources whence the dog may obtain *Trichina*, no one need in future be surprised at finding this animal affected with the disease; and since the malady is so readily transmissible, care should be taken to destroy, thoroughly, all trichinized animal flesh wherever and whenever encountered. In illustration of the facts above

* 'Proceedings,' for March 26, 1861.

given, I may mention that I have caused *Trichinæ* to be transferred from the flesh of man to a hedgehog, then from the muscles of this hedgehog to a dog, and ultimately from the dog to a pig. It was in this last-named animal that I obtained about 15,000,000 *Trichinæ*—enough to have trichinized half the inhabitants of London, could each individual have been induced to partake of a minute portion of the uncooked flesh. As it was, I had some difficulty in persuading bystanders at the *post mortem* dissection that the perfectly healthy-looking flesh had anything the matter with it; and one person actually carried off the heart of the animal as a perquisite. Fortunately *Trichinæ* do not stay in the substance of the heart, although they pass through it; and thus the lucky person who ate the heart could by no possibility have sustained any injury, even if it were insufficiently cooked. Lastly, I will only add that I consider further experiments with *Trichina spiralis* unnecessary, and even undesirable from a hygienic point of view.

7. *Ascaris marginata*.—Of all the parasites infesting the dog in England this species is the commonest. I have met with it in about thirty out of forty dogs dissected by myself and friends. It does not appear to be quite so common abroad; nevertheless, out of 144 dogs dissected at the Vienna Museum, it was present in no less than 104 instances. At Copenhagen Dr. Krabbe found it present 122 times out of 500, or in 24 per cent. of the dogs he examined; but in Iceland, where other forms of canine entozoa are extremely abundant, only two dogs out of 100 were found to entertain this species. Fortunately the common roundworm of the dog is a very harmless parasite, so far as the health of the people is concerned, and it is apparently only in exceptional instances that it proves injurious to the dog itself.

8. *Eustrongylus gigas*.—This species is probably the rarest of canine entozoa. The only specimen which I have seen as coming from the dog is the very perfect one preserved in the Museum of the Royal Veterinary College, London. Probably not one in 5000 dogs harbours this entozoon; but since it is liable to occur in man, and has several times been noticed in the congeners of the dog, the possibility of its becoming more frequent should be considered. The Museum of the Royal College of Surgeons, London, contains some fine examples and several dissections of this parasite.

9. *Bothriocephalus latus*.—Although there is some difficulty in determining the number of species of *Bothriocephalus* liable to

infest the dog, it is generally agreed that this form is both human and canine, so to speak. In either case it is believed that the "host" acquires possession of the parasite by the consumption of fish. Dr. Knoch, of Petersburg, believed he had succeeded in rearing this species in dogs by direct experiment with its embryos; but the necessity of an "intermediary bearer" has been clearly established by Leuckart. The presence of *Bothriocephali* in the dog in this country is very rare. One such cestode may be seen in the Museum of the Royal Veterinary College; and no doubt can be entertained that it belongs to this species.

10. *Bothriocephalus cordatus*.—This form is quite distinct from the above, and seems to be very abundant in the dogs of North Greenland, where it also occasionally infests the human body. In the dog it occurs in considerable numbers, and can scarcely fail to occasion the animal more or less distress; but we have no evidence to show that it gives rise to any inconvenience in the human subject, where, so far as is at present known, it either exists singly or in very small numbers. Its comparative abundance in the dog doubtless depends upon the more ready access which that animal has to the uncooked food containing the larvæ, which latter are supposed to abound in marine fish.

11. *Bothriocephalus fuscus*.—Dr. Krabbe, of Copenhagen, described a variety of pit-headed tapeworms obtained from dogs in Iceland, all of which appear to be distinct from the above species. He recognizes three separate kinds (*B. fuscus*, *B. reticulatus*, *B. dubius*), severally presenting marked features of their own; but he is not prepared to affirm that these characters have any specific value. I do not now discuss this point, but I may remark, in passing, that the preparations of *B. cordatus* sent me by Prof. Leuckart, and the specimens of *B. fuscus* presented to me by Dr. Krabbe, afford convincing proof of the distinctness of these two forms. Taking the *Bothriocephali* as a whole they only occur in the ratio of 5 per cent. in Iceland, whilst Dr. Krabbe's investigations also show that in Denmark they are very much less frequent. In the 500 dogs examined at Copenhagen he only found one infested. It is by no means improbable that one or other of the forms will be discovered in this country.

12. *Tænia marginata*.—The tapeworms, properly so called, are far more numerously represented than the *Bothriocephali*; and this is one of the commonest forms. The frequency with which I have encountered it leads me to conjecture its presence in at least 25 or 30 per cent. of our English dogs. In Denmark it is

rather less abundant, being found, according to Krabbe, in 14 per cent. whereas in Iceland it is remarkably prevalent, occurring in no less than 75 out of the 100 dogs which he examined. This parasite is seldom found alone, and, being the largest species liable to infest the dog, proves a formidable guest to its canine host. Up to the present time it has not been described as occurring in man; nevertheless I have seen portions of a tapeworm, apparently referable to this species, which I was assured had come from the human subject. From the first, I expressed the strongest doubts as to its source. The dog acquires this parasite by swallowing the large cestode larvæ which are frequently attached to the viscera of the sheep. Dr. Möller, as is well-known, tried to rear this parasite in himself, by swallowing the fresh uncooked larvæ (*Cysticercus tenuicollis*), but he did not succeed; and consequently we are not at present warranted in concluding that this species can under any circumstances develop itself in man. Mr. Simonds and myself have succeeded in rearing several examples of this entozoon in the dog by direct experiment. One or two instances are on record of the occurrence of the larvæ of this species in man; and I have myself pointed to affirmative evidence in yet another case. In none of these examples is there any reason to suppose that the larvæ in question did any harm; yet it would be very unadvisable to allow of steps being taken which could promote its more frequent development within the human host. Sewage-distribution where dogs abound would aid in securing this undesirable end.

13. *Tænia cœnurus*.—This species is likewise obtained from the sheep, though by no means exclusively so, as some imperfectly informed persons seem to suppose. Its prevalence in the dog, however, is comparatively rare. I have succeeded in rearing it without any difficulty, but I do not remember to have encountered the entozoon in any dog which had not previously been made the subject of a *Cœnurus*-worm-feeding. I need hardly say that its larval form (*Cœnurus cerebralis*) gives rise to the "gid" in flocks; but it also proves detrimental to several other animals. Indirectly, therefore, it affects man himself; yet, in this country, the "gid-disease" is seldom sufficiently prevalent to cause serious loss to the sheep-breeder. In other countries, Hungary for example, losses on this score are said to be very considerable. In Denmark Dr. Krabbe encountered this entozoon in only 1 per cent. of the dogs he dissected, but in Iceland he found it in no less than 18 per cent. Clearly the "gid" must abound in that country. It is

not generally known, even by those who have some acquaintance with helminthological matters, that the larvæ of this tapeworm sometimes infest the rabbit, giving rise to a formidable disease having its seat in the muscles and soft parts of that animal. In a paper communicated to this Society, I have already explained that Mr. C. B. Rose, F.G.S., was the first to direct attention to this important fact; but his explicit statements on this head have been either carelessly overlooked, or purposely disregarded. I regret to observe that there are persons who, whilst fairly recording the information they obtain from foreign writers, appear to be studiously careful to avoid giving credit to the labours of their own countrymen. In the curious discovery before us we have another unexpected source indicated whence the dog may obtain the adult parasite, and thus, in its turn, afflict another group of creatures with the so-called bladder-worm disease.

14. *Tænia cucumerina*.—Without doubt this is the commonest of all the forms of canine entozoa. I have little hesitation in saying that it is present in two out of every three dogs at present living in this country, excluding puppies up to three months old. Krabbe found it present in 48 per cent. at Copenhagen, and in 57 per cent. in Iceland. It appears to be very prevalent throughout Europe, and probably is more or less so in all other countries. So far as we know, the cucumerine tapeworm is a tolerably harmless parasite; but, notwithstanding the efforts of investigators, nothing certain is understood respecting its true larval source. In the adult state it sometimes occurs in prodigious numbers, and often associated with other parasites. In one valuable animal, a pointer, which died suddenly, I found between 500 and 600 of these parasites, associated with numerous examples of three other kinds of entozoa. Clearly, in this particular instance, entozoa were the cause of the dog's death. If the canine tapeworm species, *which are dangerous* to human life, became as abundant in this country as the harmless *Tænia cucumerina* is thus shown to be, our mortality would be increased by many thousands annually. This will be made more apparent in the sequel.

15. *Tænia serrata*.—Though by no means so abundant as the preceding, this form is nevertheless sufficiently common, whilst it is also more injurious to the bearer. Taking one variety of dog with another, I should say that it occurs in at least five per cent. of our English dogs; but in harriers and greyhounds I have little doubt that its presence is all but invariable. At Copenhagen Dr. Krabbe only encountered this parasite once; and in Iceland it

seemed altogether wanting. The practice of giving the viscera of hares and rabbits to sporting dogs (which I have myself occasionally witnessed in the field) will always ensure its prevalence in this country. On five or six separate occasions I have reared this tapeworm in dogs by the administration of the larvæ (*Cysticercus pisiformis*) taken from recently killed rabbits. It is one of the most easily reared of all the canine parasites, and, if due attention be paid to the form and size of the head and its conspicuous crown of hooks, cannot well be confounded with its allies. The older helminthologists are not trustworthy respecting the prevalence or otherwise of this species on the continent, since they regarded several distinct forms as identical. Even Dujardin was sceptical respecting the distinctive characters, severally, of *Tænia serrata*, *T. marginata*, and *T. crassiceps* (of the fox).

16. *Tænia litterata*.—This well-marked form is described by Dr. Krabbe under the name of *T. canis lagopodis*; but notwithstanding the priority of Rudolphi, I prefer the subsequent and more distinctive nomenclature of Batsch, especially also because the parasite is not by any means peculiar to the Arctic Fox (*Canis lagopus*). Here we know nothing of this parasite; and it may be that it does not exist in England. On the other hand, its general resemblance to *Tænia cucumerina* may have caused it to be overlooked. It seems from Krabbe's extended researches to be altogether wanting in Denmark; but in Iceland he found it in 21 of the 200 dogs which he there dissected. In the absence of any definite knowledge respecting its larval source, it may be assumed, as regards man, to rank amongst the so-called harmless species. The joints (judging from the specimens kindly sent me by Dr. Krabbe) have somewhat the appearance of those of *Bothriocephali*, owing to the central and ventral disposition of the reproductive organs. The orifices themselves, however, are not actually visible, though probably present in thoroughly mature segments.

17. *Tænia echinococcus*.—I come now to speak of a parasite of the highest interest in relation to public health. Though fortunately extremely rare in the adult condition, it is nevertheless sufficiently abundant to produce occasional fatal results by means of its larvæ. What is the actual amount of human mortality thus annually caused in this country it is not easy to say; nevertheless I know it to be something considerable; and there is reason to fear, in the absence of due precautions, that it may become much greater. The larvæ or *hydatids* are familiar to every hospital

surgeon. The adult parasite has frequently been reared by foreign experimenters; but although several hydatid-feedings have been administered to dogs in England, only one such feeding has, so far as is known, been attended with positive results. This instance has recently been communicated to the Royal Society, the experiment having been made by Mr. Edward Nettlehip*. I am sorry to believe also that I may have previously reared this parasite. I say "sorry," because the subject of the experiment, a small black dog, was liberated, by an ill-designing person, a few hours before the time I had appointed for destroying it. It is true that I had previously, in one or two other dogs, obtained only negative results; but in those instances none of the conditions likely to ensure success were so favourable as in the case of the liberated animal. At all events, Mr. Nettlehip, following up the experiment after a precisely similar method to that I had adopted, obtained a complete success. The freedom of one animal harbouring *Tænia echinococcus* must be fraught with serious danger to the community; and yet it is to be feared that at the present time several dogs thus infested roam at large in this country. Certainly I have no desire to add to their number. In Copenhagen Dr. Krabbe encountered this parasite in *two* only out of 500 dogs; and yet the parasite is probably more abundant in Denmark than in England. In Iceland, on the other hand, where the mortality from the hydatid- or echinococcus-disease embraces one-sixth of all who die in that country, Dr. Krabbe found 28 dogs out of 100 harbouring this entozoon. Up to the present time no person, I believe, in England has seen this parasite in any dog which had not previously been made the subject of experiment.

In order to obtain an approximately correct notion as to the amount of echinococcus-disease prevalent amongst us, I devoted some three or four weeks in the winter of 1864 to an examination of the collections of entozoa contained in nine of the principal Pathological Museums of the metropolis. The results of this search, independently of data derived from other sources of evidence, have convinced me that hydatids are far more prevalent than is generally imagined. In these collections I found no less than 195 instances of hydatid-disease out of a total of 368 cases of helminthiasis of all kinds. It is my deliberate belief that not less than 400 deaths annually occur in England from this source. Doubtless, if one could acquire correct statistical evidence re-

specting the amount of fatality from all the entozootic diseases combined, the rate of mortality from parasites would be considerably larger than this figure, by itself, implies; yet it fortunately happens that comparatively few of the other kinds of entozoa at present prevalent in England lead to fatal results. Such cases are exceptional. It is equally certain, on the other hand, that much misery and discomfort is produced by the less hurtful species. A very great deal of good might accrue from the acquisition of more extended evidence respecting the prevalence or otherwise of all the known forms of entozoa infesting man and the domestic animals in this country. A report of this kind, drawn up somewhat after the fashion of the present communication, would, I conceive, prove highly useful. Such a report should not be a mere record of helminthic epidemics collected from foreign sources, but should be a sound and scientific contribution based upon a practical knowledge of entozoa acquired by years of previous research (extended, if possible, by personal observations made in various parts of the country and under every variety of circumstances). It is one thing to give a literary *resumé* of the progress of this department of science abroad, and another to record the actual position in which we stand in respect of entozootics at home. Except by exclusive and prolonged devotion to this subject no great ultimate good can be accomplished. A properly qualified person, always on the alert, could embrace many opportunities of special research which must of necessity be lost to the mere closet report-maker. In illustration of this let me give an instance. In the '*Times*' of Saturday, July 14th, 1866, we read that "Among the claims presented to the Glamorganshire Court of Quarter Sessions, was a claim for poison used in killing stray dogs at Merthyr; another was from the chief inspector of the Swansea police for killing 100 dogs, at 1s. each; while the third was from a person who charged one guinea for the removal and interment of three cartloads of the dead bodies of the dogs." Now, I have no doubt whatever as to the wisdom of destroying these animals; but here is an example of one of those lost opportunities of investigation to which I have alluded. An examination of the bodies of these animals would have been particularly instructive if conducted in relation to the great subject of entozootics. Much more might be said on this head; but I leave it for a future occasion.

18. *Pentastoma tænioides*.—This parasite resides in the nasal cavity and frontal sinuses of the dog, but it is comparatively rare

in England. In the young state, and under a different name (*P. denticulatum*), it is frequently seen in the human body on the continent. Its mode of introduction into the latter "host" has not been ascertained with certainty; yet there can be very little doubt that the sneezing of an infested dog in the face of any person would readily transfer the eggs and embryos of the parasite from one host to the other. In like manner, and by the same means, the ova may be cast over and become attached to food, and then be subsequently conveyed to the human stomach. Fortunately its presence in man appears to be unattended with danger; yet any considerable number of these parasites could scarcely fail to produce more or less inconvenience. In Germany it seems to be rather abundant; for Frerichs (no mean authority) states that it is "far more common in the human liver than the echinococcus." In confirmation of this statement it has been shown to be present in from 5 to 15 per cent. of *post mortem* examinations conducted in different German cities. I have myself frequently encountered this parasite in the juvenile state in animals, but not in the human body. The Pentastomes recently described by Dr. Aitken, from the human liver, belong to another and more formidable species. Strictly speaking, these creatures are not true entozoa, although their habits often cause them to be classed as such. Their mode of introduction into the nostrils of the dog is readily accounted for, since the larvæ are constantly present in the flesh of herbivorous mammals, and must frequently, during the act of feeding, be brought in immediate contact with the dog's nose.

19. *Cysticercus cellulosæ*.—Two or three authors (Gurlt, Chabert, and Hartwig) have stated that the common measles of the pork-tapeworm is liable to occur in the dog; and since we know that it is occasionally found in man, there is no good reason for doubting the correctness of their conclusions. It has been found attached to the membranes of the brain, in the muscles, and in the cavity of the abdomen. If the dog were a thoroughly suitable "host," this larva would in all likelihood be much more common in the canine bearer than it is at present supposed to be. The possibility of its occurrence and the probability of its having been frequently overlooked should both be considered in reference to future investigations in this direction.

20. *Filaria trispinulosa*.—This little parasite, once found by Gescheidt in the eye of a dog, is probably only a sexually immature form of *Ascaris*. The specimen, however, was one-third

of an inch in length, and recorded as a female. It does not appear to have since been met with.

21. *Filaria sanguinis*.—Under this title I have a few more words to say respecting the so-called hæmatozoa of MM. Grube and Delafond. These investigators, some years back, examined 480 dogs, and in nearly five per cent. they found *Filariæ* in the blood. The parasites were extremely minute, their diameter being less than that of the dog's blood-corpuscle! There can be no doubt that they were larvæ of some known, or unknown, species of nematode. I have already hinted that these hæmatozoa might be the brood of *Spiroptera sanguinolenta*; yet in only one instance were sexually mature nematodes (of comparatively large size) found in the heart. In this case the authors obtained six specimens, "of which four were females and two males; and they were lodged in a large clot occupying the right ventricle." They measured from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch in length. MM. Grube and Delafond believed they had encountered a new species, and accordingly gave it the long name of *Filaria papillosa hæmatica canis domesticæ*. In most of the dogs the entire circulatory system does not appear to have been examined; therefore it is quite possible that adult worms may have been present in more instances than the one specified—perhaps in several. If such had been proved to be the case, it might have been fair to have inferred a genetic relation between the microscopic hæmatozoa on the one hand and the worms in the heart on the other. As the matter now stands, we are in doubt as to the true adult representative of these minute *Filariæ*. With the verminiferous blood MM. Grube and Delafond performed a variety of curious experiments, but they did not, so far as I am aware, employ any worm feedings. They satisfied themselves that the hæmatozoa could only live, as such, in the blood itself, and they estimated that the verminous dogs severally entertained from 11,000 to about 224,000 of these larvæ. In no case, however, had the infested animals appeared to suffer inconvenience.

Conclusion.—I have thus, in a condensed form, brought together a large number of facts having reference to the frequency of occurrence and variety of entozoa liable to infest the dog. The way in which I have treated the subject is somewhat novel, my object being to open up a new field of inquiry, bearing more less closely on questions of public health. The full importance of helminthology in relation to entozootics can only be understood by expositions of this kind, based upon investigations extending

over a long period of time. To do justice to the subject, one must not only be acquainted with the commoner forms of entozoa, but also, to some extent, with the rarer. The experimental method enables us to determine the origin and course of development of many forms, and helps us to discriminate between the harmless and baneful species. Systematic zoology, apart from its own abstractedly scientific value, is of great assistance in aiding our arrangement of the facts in a methodical and easily understood manner. A consideration of all the known facts relating to any one particular entozoon often permits us to state precisely to what extent the species is injurious to the human race as well as to the particular intermediary bearer. We are also frequently in a position to point out what circumstances are sure to increase, or, on the other hand, to decrease, the prevalence of any particular species. We can even go further than that, and show how certain forms may be entirely eradicated. At all events, we have it in our power both to diminish the number of human sufferers from entozootics, and to check, if not entirely to prevent, the invasion of these endemics. Substantial results of this kind being patent to all intelligent people, we can afford to disregard the policy of the ignorant who deride our labours. From researches such as these, the Linnean Society cannot legitimately withhold its sympathy, since a recognized department of natural-history science is thus made practically subservient to the public welfare. In the present case, moreover, this communication, though differing somewhat from the ordinary character of its received contributions, is, after all, only a continuation of my other papers which have already been honoured with the Society's approval.

Note on the "*Spiroptera sanguinolenta*" of Rudolphi, a Parasite found in the Heart of Dogs in China. By W. BAIRD, M.D., F.L.S. With an Account of the Occurrence of these Worms at Shanghai, by J. LAMPREY, M.D., 67th Regiment.

[Read May 2, 1867.]

At the conclusion of Dr. Cobbold's paper on the Entozoa of the dog, read on the 18th of April, Dr. Lamprey called the attention of the Society to the fact that the dogs of China, both native and European, were peculiarly liable to the attack of a species of Entozoa, lodging in the heart. This worm has been referred

to the "*Spiroptera sanguinolenta*" of Rudolphi, a species which has already been noticed as existing in the heart of the dog. Since the reading of Dr. Cobbold's paper, Dr. Lamprey has kindly presented a series of specimens of these Entozoa to the British Museum. Upon examination, I found them to be of a much larger size than any of those recorded by Rudolphi, Dujardin, and Diesing. These authors agree in stating the length to be from 40 to 80 millims., about equal to from $1\frac{3}{4}$ to 3 inches. The specimens sent to the Museum were, many of them, at least 10 inches long, which would show that the habitation where they were found was favourable to the growth of these worms. Along with the specimens sent, Dr. Lamprey has kindly forwarded to me a short account of these parasites, written by him at Shanghai in 1865, which I thought might be interesting to lay before the Society.

Shanghai, July 1865.

The Entozoa were found mixed with clotted blood in the cavities of the ventricles of the heart, and extending through the openings of the valves, in the course of the pulmonary artery and aorta.

The hearts of native and foreign dogs living at Shanghai are invariably found to contain these Entozoa, which most probably have their origin in the ova of the *Ascarides* or *Trichiuris*, human excreta being the principal food of the native dog, and not disliked by the foreign dog however well fed. Tapeworm is a common accompaniment of this disease.

These Entozoa, *per se*, do not appear to interfere with the general functions of the body, so long as the animal is otherwise healthy. Sporting dogs work as usual without any impediment, and many are long-lived; but should dogs so infested be attacked with disease, such as fever or inflammation of the lungs, the Entozoa become a serious embarrassment to the circulation, and no doubt materially aid in causing a fatal termination to the disease with which they are attacked.

These Entozoa have not been as yet discovered in the human heart, either of Chinese or of Europeans living in China.

P.S. In 1866, when at the Cape of Good Hope, I lost a dog which I brought from China. This dog was attacked with fever, and died; and on examination of his body I found a large bundle of these Entozoa in the cavities of the heart. I had examined other dogs which died of the same fever at the Cape, and no Entozoa were found in their hearts; these dogs had not been in China.

J. L.

Further observations on *Cygnus Passmori* and *C. buccinator*.
By the Rev. W. HINCKS, F.L.S.

[Read June 6, 1867.]

Toronto, May 19, 1867.

My note of April 10, 1864, published in the Journal along with my paper on *Cygnus Passmori*, although intended to leave the question undecided, would doubtless be considered to favour the opinion that the supposed species is no more than a younger and less-developed form of *C. buccinator*.

I was not, indeed, myself satisfied with that opinion, which set aside all my observed distinctive marks except that taken from the sternum, and assumed that, because specimens were procured indicating progressive changes in the appearance of this part, all these changes could be reduced to one series; but it was my duty to report the facts which came to my knowledge; and for the moment these seemed to be at least reconcilable with the notion of only one species.

I have since taken every opportunity of obtaining further materials for judging, and as the result of the past winter's observations I can lay before the Society such additional facts as may, I think, enable us to settle the question.

I have now before me six sterna of our northern swans, the comparative size and external appearance of each of the birds being also known to me. One of these belongs to the original specimen named by me *C. Passmori*, the stuffed skin of which now forms part of the collection of Western Canadian birds sent by the Board of Arts and Manufactures of Western Canada to the Paris Exhibition. Two others are those which formed the subject of my note of April 10, 1864, being successive states, both of them with less enlargement of the trachea than in the first specimen, but otherwise corresponding with *C. Passmori*, of which they are doubtless younger specimens. The series of changes in these three suggested the idea of a progress of development which might be thought to terminate in the very remarkable sternum and trachea which I described as properly belonging to *C. buccinator*.

At that time I had but one specimen of this curious form, which belonged to a full-grown male Trumpeter, and I had not seen what I could be sure was the young of the Trumpeter, to ascertain its agreement or otherwise with my supposed species. I was thus, perhaps, too hasty (though, it now appears, substan-

tially correct) in supposing the two forms of sternum before me to be both mature, and consequently belonging to different species; but the doubt is now, I think, decided. During the past winter a female Trumpeter Swan with a very young male (a cygnet of the year) were shot in the immediate neighbourhood of this city. They were examined by me, and their sterna are before me.

The female, a mature bird, had a sternum exactly resembling that which I previously possessed (fig. 7 of the sketches accompanying my paper), proving the peculiarity to be neither a mark of sex nor an unusual exceptional case. The young male had the foxy colour on the head and neck which is characteristic of *Cygnus buccinator*, but (as might have been anticipated from other cases of the kind) with the colour stronger and more extended than in the old bird, thus differing strikingly from *C. Passmori*. His sternum is considerably longer than that of my largest *C. Passmori*, a little longer even than that of the female accompanying him; yet the trachea is in an early stage of development, the bone on the inner posterior face of the sternum not yet appearing, and the knob close to the vertical bone only equalling the height of the ridge of that bone, instead of rising, as in the mature bird, about an inch above it. In the specimen of *C. buccinator* previously examined the bony enlargement containing the curve of the trachea almost concealed the posterior sinuses of the sternum, as noticed in my former paper; but in the young bird we find them deeper and more elongated in form than in *C. Passmori*; and even after the formation of the bone, this difference may be observed by careful examination. On the whole, this young bird may be regarded as proving that *C. Passmori* is not the mere young of *C. buccinator*, from which, as well as from the old bird, it differs in size, weight, colouring, and the other characters pointed out, even the sternum differing before the trachea assumes the peculiar full-grown appearance. But there is another point settled by the additional specimens. I have now before me, both in the young and mature condition, the bronchial tubes of the two species, those of the true *buccinator* having been, as I stated, destroyed in the former specimen, and the extent and constancy of the differences reported being then uncertain. I can now state that, in *C. Passmori*, the lower portions of the bronchial tubes are separate and comparatively little swelled, the upper tubular parts being nearly parallel; whilst, in *C. buccinator*, the greatly swelled and enlarged lower portions adhere together, the

upper tubular parts receding from one another at a curve. This seems to be a constant and important character. I hope these details, taken in connexion with the statements made in my former paper, will be thought to justify the strong conviction I now entertain that *C. Passmori* must be received as a species. The close resemblance in general external appearance, with the difference in size, weight, and a few points of structure, may remind us of *Bernicla Hutchinsii* as compared with *B. Canadensis*. These birds are still often confounded even by sportsmen, the former being passed as the young of the latter; yet no doubt can be entertained by the scientific zoologist of their being specifically different.

I am indebted to Mr. Passmore for his attention in procuring my additional materials, and for his valuable aid in some of the investigations required.

Supplement to the List of Australian *Longicornia*.

By FRANCIS P. PASCOE, F.L.S. &c.

[Read June 20, 1867.]

THE most interesting of the following additions to the *Longicornia* of Australia are from Cape York, the extreme northern point of the continent. They were a part of a small collection of Coleoptera made by a German naturalist, which had doubtless previously yielded some of its choicest specimens to the Sydney entomologists. Judging from what remained, the collection had a completely Australian character, a few of the commoner forms of the middle and southern portions being, however, very feebly or not at all represented—*i. e.* the Buprestidæ, Hesthesis, the Stenoderinæ, Phoracantha, the smaller Lamellicornia, &c.; of one of the Colydiidæ, *Dastarcus porosus*, Walk., hitherto only found in Ceylon and Borneo, there were several specimens. Of the Lamiiidæ, the genera *Sodus*, *Atyporis*, and *Menyllus* * have now to be added to the Australian fauna. *Batocera læna*, Thoms., and *Pelargoderus Arouensis*, both hitherto restricted to New Guinea, appear to be common. *Glaucytes*, a genus found in the New Hebrides, some of the Malayan islands, and even in Madagascar, has now a representative in Australia.

* *Menyllus maculicornis*, from Aru, described by me from a single specimen, not in the best condition, in the Wallacean collection, was unfortunately forgotten when I described *Sysspilotus Macleayi*, with which it is identical. The latter name must therefore be cancelled.

To Dr. Howitt, of Melbourne, I am indebted for not less than four new species of *Athemistus*. This genus appears to take the place in Australia of the European *Dorcadion*. I have also a Tasmanian specimen of *Dorcadida bilocularis*, White, from the same gentleman, who observes that this and *Lacon variabilis* are the only Coleoptera known to him common to Australia and New Zealand; to these, however, may be added *Epithora dorsalis*, MacLeay.

Besides the new species characterized in this paper, I have described the following since the Society did me the honour to publish the list of Australian Longicornia in their Journal, viz. :—

Demomisis flum, Champion Bay, Ann. & Mag. Nat. Hist. May 1867 (3rd ser. vol. xix.) p. 310.

Thoris eburifera, Rockhampton, l. c. p. 317.

Thephantes clavatus, Darling Downs, l. c. p. 319.

Elaptus simulator, Cape York, l. c. June 1867, p. 413.

Petalodes, in consequence of its having been previously used, was changed to *Anastasis*.

HEBESECEIS BASALIS.

H. cinerascens; prothorace vittis duabus, elytris regione scutellari et fascia postmediana fuscis, his basi crista pilosa instructis.

Hab. Rockhampton.

Pale ashy; head obscurely clouded with ochreous and brown, a dark brown Δ -shaped mark on the vertex; prothorax with the disk bituberculate, ochreous at the base, bounded by a dark brown stripe on each side; scutellum squarish; elytra with an ochreous patch below the scutellum, margined with dark brown except posteriorly, a narrow band behind the middle also dark brown, the base on each side with an oblong crest composed of closely set erect dark brown hairs, each elytron with three or four longitudinal ochreous lines; body beneath and legs with a coarse whitish pubescence, the middle of the abdomen nearly glabrous, black; antennæ nearly twice as long as the body, brown, ringed more or less with white, the sixth and eighth joints entirely white. Length $4\frac{1}{2}$ lines.

This species approaches *H. niphonoides* in coloration; but the pilose crest at the base of each elytron is peculiar to it.

ATYPORIS INTERCALARIS.

A. (♀) nigrescens; prothorace vitta glabra æneo-nigra, lateribus ochreotomentosis; elytris breviusculis, pube cinerascente tectis, et ochreomaculatis.

Hab. Cape York.

Derm blackish; head covered with a greyish tomentum, two glabrous stripes on the vertex; prothorax with a broad central stripe, gradually broader towards the base, glabrous, nitid, and sparingly punctured, and on each side a dense ochreous tomentum; scutellum nearly semi-circular; elytra rather short, and somewhat cylindrical, irregularly punctured, the punctures black and glabrous mixed with small patches of ashy pubescence spotted with ochreous; body beneath and legs covered with an irregular greyish tomentum; antennæ rather longer than the body, with small spots of greyish. Length 5 lines.

Five species of this genus are described in 'Long. Malay.', all from Batchian and New Guinea; the present has shorter and more cylindrical elytra than the others, but in coloration comes near *A. jubata*.

RHYTIPHORA ARGUS.

R. pallide ochraceo-fulva; elytris mediocriter nigro maculatis, maculis parvis, distinctissimis, niveo annulatis, humeris glabratis, nigris, nitidis, apicibus oblique truncatis; antennis nigris.

Hab. Rockhampton.

Pubescence very dense, pure pale ochreous yellow; head impunctate, a white line round the eyes; prothorax short, cylindrical, transversely rugose, a few small punctures on the middle; scutellum narrow, rounded behind; elytra covered, but not crowded, with numerous small, black, very distinct spots, those at the base granulated, each surrounded with a well-limited, snowy white ring; the shoulders naked, glossy black, also surrounded with a white ring; the apices sharply and obliquely truncate; body beneath, femora, and tibiæ with a bright ochre-yellow pubescence, slightly patched with whitish; tarsi paler; antennæ black. Length 12-14 lines.

Allied to *R. polymita*, but the spots much less crowded, with the glossy black on the shoulders well-limited, and the apices of the elytra obliquely truncate, not rounded. It is one of the handsomest species of the genus.

RHYTIPHORA INTERTINCTA.

R. pallide fulva; prothorace nigro fasciato; elytris obscure nigro maculatis, maculis plus minus conjunctis, humeris supra albis, infra glabratis, nigris; antennis nigris, niveo annulatis.

Hab. South Australia (Gawler).

Pubescence pale fulvous; head glabrous, black, with patches of fulvous pubescence in front, two stripes on the vertex, line round the eyes, and a bar behind them also fulvous; prothorax with two distinct bands of fulvous, and some irregular patches between them, and an elevated glabrous transverse line in the middle; scutellum subscutiform; elytra entirely covered with a short dense pale fulvous pubescence obscurely spotted with black, each spot paler posteriorly and blending

more or less with those behind it, those towards the base also connected transversely, and forming slightly undulating bands; body beneath yellowish spotted with black; femora and tibiæ yellowish, the tarsi ashy; antennæ black, the basal half of each joint from the third to the ninth inclusive snowy white. Length 10 lines.

A very distinct species, which for the present may be placed after *R. semivestita*.

PENTHEA MACULARIA.

P. dense pubescens et nigro setulosa, albida, confertim nigro maculata; prothorace linea longitudinali glabrata; elytris disperse punctatis, haud costatis.

Hab. North Australia.

Densely pubescent, with scattered black setulose hairs, whitish or greyish white, with small black crowded spots; head sparingly punctured, impressed median line nearly obsolete; prothorax with few punctures, a smooth longitudinal line on the disk; scutellum semicircular; elytra not ribbed, the punctures scattered, very irregular, free from pubescence, and confined to the black spots; body beneath whitish, spotted with black and ochraceous yellow; legs whitish; antennæ dark brown, the scape and apex of the third joint whitish. Length 5-5½ lines.

Allied to *P. intricata* and *P. miliaris*; but the absence of costæ on the elytra, the glabrous line on the prothorax, and the uniform spotting will readily distinguish it.

SYMPHYLETES ANAGLYPTUS.

S. robustus, fusco tomentosus, supra lineis minutis brevibus irregularibus fulvis vestitus; prothorace in medio bituberculato; elytris subtrigonatis, apicibus subtruncatis.

Hab. Rockhampton.

Stout, covered above with a brownish tomentum and speckled with very small numerous short irregular fulvous lines composed of a longer tomentum, the brown spaces between them not larger than the lines themselves; head more fulvous in front, with black lines; prothorax constricted anteriorly, irregularly tumid, the middle with two small tubercles placed transversely; scutellum somewhat rounded; elytra subtrigonal, with six glossy black granules on each side at the base arranged in two rows, the apices subtruncate, nearly hidden by longish hairs; body beneath with a coarse irregular buff pubescence; legs spotted with a brown and buff pubescence; antennæ considerably longer than the body, densely fringed beneath. Length 12 lines.

A very distinct species which may rank after *S. fumatus*; the anterior coxæ are spined in my specimen.

SYMPHYLETES CAPREOLUS.

S. angustatus, rufo-brunneus; elytris parallelis, apicibus rotundatis, basi, scutellum includente, maculisque suturalibus ferrugineis, utrinque plagis duabus albidis ferrugineo signatis instructis; antennis omnino fuscis, griseo pubescentibus.

Hab. Rockhampton.

Narrow, reddish brown; head covered with coarse greyish and ochreous hairs; the antennary tubers rather large and approximate; prothorax cylindrical, finely punctured, with an almost obsolete greyish pubescence, with three vertical ferruginous lines on each side; scutellum rounded, glabrous, with a tuft of ferruginous hairs in the centre; elytra nearly parallel, somewhat elongate, the apices rounded, a ferruginous triangular patch at the base, enclosing the scutellum, and a few spots of the same colour along the suture, on each side, at equal distances from the base and apex and each other, two large white patches marked more or less with pale ferruginous; body beneath and legs with a thin greyish pile, the edges of the abdominal segments with a denser border of yellowish hairs; antennæ entirely brown, sparsely covered with greyish hairs. Length 5 lines.

The smallest and least robust proportionally of all the species of this large genus, and easily distinguished by the two white patches at the sides combined with the triangular ferruginous patch at the base of the elytra. I have seen some specimens much lighter in colour with the ferruginous spots along the suture absent.

SODUS VENOSUS.

S. sericeo-griseus; capite fusco-griseo; prothorace fulvo-griseo, postice constricto; elytris utrinque paulo excavatis, in medio planatis.

Hab. Cape York.

Silky grey; head brownish grey, closely and finely punctured; prothorax not quite so broad as the head, constricted, and rather narrow posteriorly, covered with a dense fulvous grey pubescence, the disk bituberculate, the apex of each tubercle crowned with a few longish setæ; scutellum indistinct; elytra irregular, the middle of each side slightly excavated, the disk between flattened, the pubescence on these parts very thin, with a few small scattered punctures, posteriorly the pubescence much denser; body beneath and legs reddish brown, with a thin grey pile; antennæ with the first three joints brown and closely punctured, the remainder with an ashy pubescence. Length 5 lines.

This is a very interesting addition to the genera of the Australian insect-fauna, the only two other species of *Sodus* being from Singapore and Penang respectively; although unmistakeably congeneric, they are very distinct, the Penang species (with the prothorax dilated posteriorly and the slight emargination of the intermediate tibiæ) being the most aberrant. They are all

covered, especially the antennæ, with long scattered setulose hairs. The irregularity of the elytra of the species before us is exceptional: and this, with the marked difference of density of the pubescence, gives them a variegated appearance. The following are the amended diagnoses of the two Malayan members of the genus:—

Sodus verticalis (Pascoe, Long. Malay. p. 137, pl. vii. fig. 5). *S. fuscus*, nitidus; genis, vertice, antennisque basi, niveis; prothorace turgido, postice paulo constricto; elytris regularibus. *Hab.* Singapore.

Sodus ursulus (Pascoe, Proc. Zool. Soc. 1866, p. 237, pl. xxvi. fig. 2*).

S. fulvo-brunneus, opacus, capite pallidiore; prothorace basi latiore; elytris regularibus, late ovatis. *Hab.* Penang.

LYCHROSIS AFFLICTUS.

L. pubescens, niger, obscure cinereo varius; scutello parvo, triangulari, indistincto; antennis fere nigris.

Hab. Cape York.

Thickly pubescent; head finely punctured, glabrous, black, the cheeks with a whitish pubescence; prothorax quadrate, the sides nearly parallel, pubescent, white, with three ill-defined glabrous black stripes; scutellum small, triangular, nearly hidden by white hairs; elytra irregularly punctured, the punctures large and well-marked at the base, pubescence thin and black, sprinkled with a longer white pilosity, the apices very obliquely emarginate; body beneath and femora with a thin ashy pile, the abdomen greyish, the last segment black; tibiæ and tarsi greyish; antennæ nearly entirely black, the bases of the four or five last joints slightly tinged with white. Length $5\frac{1}{2}$ lines.

Much longer and more cylindrical than *L. luctuosus*, and entirely without the large well-marked white patches which distinguish that species.

HATHLIODES COSTULATUS.

H. supra brunneo-ochraceo pubescens; elytris basi prothorace latoribus, costulatis, apicibus dehiscentibus.

Hab. Champion Bay.

Rather short, covered above with a close brownish-ochraceous pubescence with small whitish setæ interspersed; head nearly impunctate; prothorax with a few scattered punctures on the disk, a brownish stripe on each side behind the eyes; scutellum semicircular; elytra finely punctured, broader than the prothorax, each with raised lines, including one at the suture, but not extending to the apex, the sides rather abruptly declivous, the apices dehiscent; body beneath and legs coarsely pubescent, dark ochreous; antennæ about two-thirds of the length of the body. Length 6 lines.

Resembles *H. quadrilineatus*, but shorter, without darker stripes, and the elytra with raised lines.

* The figure is too brightly coloured, and the prothorax is not represented sufficiently broad at the base.

PHÆAPATE DENTICOLLIS.

P. griseo pubescens; prothorace utrinque dentato, disco fusco; elytris in medio cinerascens, apicibus oblique truncatis.

Hab. Rockhampton.

Derm dark brown, with a greyish pubescence; head covered with shaggy hairs in front, not concealing the small scattered punctures; prothorax with a small sharp tooth on each side, the disk with a broad subglabrous stripe, well limited at the sides, and very distinctly punctured; scutellum very broad, dark brown, glabrous, minutely punctured; elytra with two raised longitudinal hairy stripes at the base, united towards the middle, another at the shoulder, a large pale ashy patch in the middle common to both elytra, the apices obliquely truncate; body beneath, legs, and antennæ covered with loose greyish hairs. Length 5 lines.

Easily distinguished from *P. albula* in colour, and by the small lateral tooth of the prothorax; except in fresh specimens, the raised hairy lines on the elytra are unnoticeable.

ATHEMISTUS BITUBERCULATUS.

(Howitt's MS.)

A. vinaceo-fuscus; prothorace tuberculato, sparsim impresso-punctato; elytris confertim granulatis, postice bituberculatis, apicibus oblique truncatis, angulo externo obsoleto.

Hab. "Mountains of Victoria."

Claret-coloured brown, thinly pubescent; head almost impunctate, except on the vertex; prothorax nearly equal in length and breadth in the male, shorter in the female, sparingly punctured, the disk with four to seven tubercles (three intermediate nearly obsolete); scutellum very small and indistinct; elytra narrowly ovate, covered with small elongate granules arranged in somewhat oblique lines, on the declivity posteriorly on each side a large mamillary tubercle, the apices oblique, the external angle nearly obsolete; body beneath and legs reddish brown; antennæ not quite the length of the body (σ), but shorter in the female. Length $5\frac{1}{2}$ lines.

Differs from all the other species of the genus, except *A. Æthiops*, in the two posterior tubercles of the elytra.

ATHEMISTUS HOWITII.

(*A. kiamæ*, Howitt's MS.)

A. fulvo-fuscus; prothorace fere impunctato, quinquetuberculato; elytris tuberculis nitidis instructis, apice singulorum truncato, angulo externo acuto.

Hab. Kiama (New South Wales), Clarence River (Queensland).

Pubescent, fulvous-brown; head with few punctures; prothorax nearly impunctate, its disk with five tubercles, the three anterior oblong shining; scutellum small, narrowly triangular; elytra narrowly ob-

long, scarcely so broad as the prothorax in the male, covered with not very closely arranged glossy oblong tubercles in somewhat oblique rows, the apices truncate with the external angle acute; body beneath dark brown; legs and antennæ pale, the latter in both sexes not so long as the body. Length $5-5\frac{1}{2}$ lines.

Very like *A. rugosulus*; but the latter (*inter alia*) has the apices of the elytra rounded, and the prothorax much more punctured.

ATHEMISTUS PUNCTICOLLIS.

A. fuscus, pilis erectis minutis dispersis; prothorace confertim punctato, utrinque tuberculo rotundato fere obsoleto.

Hab. Omeo (Gippsland).

Dark brown, finely pubescent, with numerous small erect hairs interspersed; head with few punctures; prothorax closely punctured, on each side above the lateral tooth a low rounded very indistinct tubercle; scutellum small, narrowly triangular; elytra narrower than the prothorax (♂), covered with elongate shining granules in nearly regular rows, the conjoined apices rounded; body beneath, legs, and antennæ dark brown, the latter much shorter than the body. Length $5\frac{1}{2}$ lines.

The short flying hairs of this species, with the non-tuberculate (or nearly so) and closely punctured prothorax, at once differentiate it; in *A. pubescens*, the only other setosely pilose species, the hairs are much larger and longer.

ATHEMISTUS ÆTHIOPS.

(Howitt's MS.)

A. ater, opacus; prothorace grosse punctato, quinetuberculato; elytris confertim verrucosis, postice bituberculatis, apicibus truncatis, angulo externo obsoleto.

Hab. "Mountains of Victoria."

Black, opaque, pubescence with a brownish tinge; eyes rather approximate above; prothorax coarsely punctured, the disk with five tubercles, the three central much less distinct; scutellum broadly triangular; elytra ovate, broader than the prothorax in both sexes, closely covered with warty tubercles, which are much larger at the shoulders, posteriorly on the proclivity of each elytron a prominent tubercle, the apices rounded; antennæ in both sexes above two-thirds of the length of the body. Length $3\frac{1}{2}$ (♂)– $4\frac{1}{2}$ (♀) lines.

A small black species, like *A. funereus*; but the two posterior tubercles on the elytra are sufficiently distinctive*. Dr. Howitt,

* Dr. Howitt mentions, in his note on this species, that the "spot on the disk of the elytra when first taken is snowy white." An exceedingly indistinct spot, which I at first overlooked, may be detected with a good lens nearly in the middle of each elytron. There are also traces of yellowish patches at the base or sides of the prothorax in some other species.

to whose kindness I am indebted for the new species of this genus here described, mentions a still smaller one than this, taken in an ants' nest near Sydney, in company with *Cordus hospes*, Schön., and *Lacon geminatus*, Cand. Another many-spined species, found under a log of wood at Brisbane, is also alluded to.

GLAUCYTES SUTURALIS.

G. fuscescens, capite, prothorace, maculisque elytrorum griseo-argenteis, pubescentibus; elytris octomaculatis, regione suturali depressis, griseo pubescentibus.

Hab. Cape York.

Light brownish, shining, head and prothorax closely covered with a silky greyish-silvery pubescence, a few punctures in front between the antennæ, none on the prothorax; scutellum small, rounded behind; elytra with eight spots and a broad central stripe covered with a silky greyish pubescence, the rest glabrous, very distinctly punctured, the suture flat or even somewhat hollowed from a point a little behind the scutellum nearly to the apex, which is truncate, with a strong spine at the external angle; body beneath black, shining, a very thin whitish pubescence along the sides; femora pale reddish brown, white at the base; tibiæ and tarsi blackish; antennæ dark brown. Length 5 lines.

Allied to *G. scitulus*, a Batchian insect, but different in colour and distribution of pubescence, and at once distinguished by the concave depression along the suture; another species is found in the New Hebrides, and two more in Madagascar. The genus certainly does not belong to the *Tmesisterninae*, in which it has hitherto been placed.

STRONGYLURUS CERESIOIDES.

S. testaceo-fuscus, disperse albo pilosus; prothorace vix longiore quam latiore, grosse punctato, albo quadrimaculato; elytris modice elongatis, apice rotundatis.

Hab. Tasmania.

Testaceous brown, with dispersed stiffish hairs clothing the upper surface; prothorax not longer than broad, coarsely punctured, the punctures closely approximate but not confluent, four white spots on the disk, the two posterior largest; scutellum rounded, white; elytra moderately long, thickly punctured, rounded at the apex; body beneath and legs with long whitish hairs; antennæ with the first two joints glabrous, shining, the remainder pubescent, opaque. Length 6 lines.

A species resembling *S. scutellatus*, Hope, but with a shorter prothorax, differently punctured, and broader elytra in proportion to their length, of uniform colour.

On the Anatomy and Physiology of the Tunicata.

By ALBANY HANCOCK, F.L.S.

[Read June 20, 1867.]

HAVING employed myself recently in the investigation of the Tunicata (their anatomical structure and physiology) with a view to a monograph of the British species, which my late lamented friend Mr. Alder and I had undertaken to prepare for the Ray Society, some very interesting anatomical facts have come to light; and I now propose to give a succinct account of the more important of these, believing that they cannot fail to be acceptable to those naturalists who may have studied these low but not by any means unattractive mollusks. I reserve, however, for some future occasion a more complete and detailed description.

When I took up this subject, I had little expectation of meeting with much that was new; for perhaps in no other group of the Molluscan subkingdom has the anatomy been so frequently and so ably investigated as it has been in the Tunicaries; and, indeed, in them, all the leading points appear to have been fully determined; but experience proves, nevertheless, that much of interest has been left unobserved, quite sufficient to reward the labour of reexamination, and seemingly ample enough to modify some of the more important morphological determinations.

This unexpected result may, in part, be owing to the fact that, while my researches have been chiefly confined to the simple Ascidians, it is apparently to the compound, social, and pelagic forms that the greatest attention has been hitherto given. Thus it happens that numerous details have remained until now unnoticed in the former group.

There is something fresh to record in nearly all the visceral organs, but in none so much perhaps as in the vascular and respiratory systems. Before entering, however, on such new matter, it will be well to say a few words respecting the tunics, so characteristic of these animals. In all the various forms that have been examined, there is no great difficulty in determining the presence of three tunics, or envelopes—namely, the test or outer tunic, the mantle or inner tunic, and the lining membrane or inner tunic of Prof. Huxley.* The lining membrane and mantle are always, to a greater or less extent, adherent to each

* This tunic was first pointed out by M. Milne-Edwards, in his work on the *Ascidies composées*, p. 54.

other, and have, except where there is an abdomen developed, all the viscera and the lacunary portion of the blood-system placed between them. On the other hand, the mantle and test in *Ascidia* and *Molgula* are always free, except at the distal extremity of the respiratory tubes, where they are united; there is also an attachment at the point where the vascular trunks enter the test. But in the genus *Styela* (Savigny's third tribe of *Cynthia*) the test is always more or less firmly attached to the mantle throughout, though at the respiratory orifices the adhesion is greatest. In all the species, however, that have been examined, with the exception of one (a small undescribed species), these two envelopes may be separated without much difficulty in specimens preserved in spirit. In the exceptional case alluded to, the mantle is exceedingly delicate; and hence probably arises the difficulty of separating it from the test. In this genus, as well as in *Ascidia* and *Molgula*, blood-vessels pass from the body to the test. It is therefore likely that vessels will be found ramifying in the outer tunic in all the simple Ascidiaceans. In *Pelonaia* the adhesion of the mantle and test is not by any means so remarkable as was originally supposed; and, indeed, in this form they are as easily divided as they usually are in *Styela*. Also in *Clavelina* these two tunics are slightly adherent throughout, while in *Salpa* they appear to be as free as they are in *Ascidia**.

It should be mentioned that, in a living state, unless the mantle be violently contracted, there is no actual vacant space, or space filled with fluid, as has been asserted, between it and the test; even in those species which have these tunics comparatively free the two surfaces lie in close contact. When the animal is dead, however, and preserved in spirit, the body enclosed in the mantle does not by any means occupy the entire space within the test, but lies somewhat shrivelled, and frequently quite free, just as commonly happens with the animal of the Lamellibranchs under similar circumstances.

The chief function of the test, like that of the shell in the higher mollusks, is no doubt to protect the comparatively soft and delicate portions of the animal that lie within it. But it will also act, by its resiliency, as a counterpoise to the muscular contractility of the mantle, which lines it as it were. In those species, such as *Styela tuberosa*, in which the mantle and test are adherent throughout, this action is readily understood; it is not,

* I have examined only one species, namely *S. spinosa*; and the specimens were preserved in alcohol.

however, quite so obvious in the species which have these two tunics comparatively free, as they are universally in *Ascidia* and *Molgula*. But we have just seen that, in such instances, the inner surface of the test, and the outer surface of the mantle, lie in close contact with each other. Now, as under all ordinary circumstances, the pressure of the water inside the mantle must be as great as that of the water resting against the outer surface of the test, and as no water can possibly enter between these two tunics, it is clear enough that they will be held together with no inconsiderable force. Thus, when the muscles of the mantle contract, diminishing the bulk of that organ, the test will be drawn in after it; and so soon as the muscles of the former relax, the latter, through the elasticity of its walls, will expand, and the mantle will be constrained to do so likewise.

The most interesting matter that I have to communicate respecting the digestive system relates to the biliary apparatus. A remark or two, however, may be made, in the first place, upon the alimentary canal, which, in all the species that have come under my inspection, makes its first bend towards the dorsal region, assuming that to be the dorsal aspect where the endostyle is placed. The intestine then usually ascends and crosses over (in a more or less undulatory course, sometimes forming one or two loops) to the opposite or ventral side, where it again ascends to reach the cloaca, into which, in the Ascidians, it invariably opens. The walls, from one end of the organ to the other, are particularly firm, and do not collapse even in preserved specimens. The lower portion of the intestine is the most delicate; but even here the wall rarely shrinks. The stomach is well marked, though it is never very bulky, and is usually lined with a stout mucous membrane, which is frequently plaited or wrinkled, sometimes in a symmetrical manner, the plaits extending into the oesophagus on the one hand, and into the intestine on the other. In the latter organ this membrane is thrown up so as to form a very conspicuous groove, which extends from the stomach to that portion of the intestine which may be termed the rectum. In *Styela tuberosa*, and some other species, however, this groove extends the whole length of the intestine.

The food of the Tunicaries is extracted from sedimentary matters; there is no power of selection in the first instance; those particles which can be, are digested; the others, chiefly composed of sand and mud, are rejected in the usual manner. This sedimentary aliment is sifted from the water in the respi-

ratory sac, by the aid of the branchial network, and is then carried across the organ by the action of cilia; but no definite arrangement of the particles takes place until they arrive at the oral or ventral lamina, where they are formed into a cord of some tenacity, apparently through the agency of mucus, and are carried thus moulded along this lamina to the oral orifice, and so swallowed. This alimentary cord is conducted through the digestive tube, and is rejected in the same form by the anus and excurrent tube. The cord-like faeces may frequently be seen through the wall in the lower portion of the intestine, having very much the appearance of a convoluted tube lying within the canal. In some of the lower forms, however, it is broken up into elongated pellets.

All this is very similar to what takes place in connexion with the alimentation in the Lamellibranchs; but in them the lateral currents of particles are as well defined as the main or central ones.

Molgula and Savigny's first and second tribes of his genus *Cynthia* appear to be the only forms among the simple Tunicates that have hitherto been described, as possessing a well-developed liver. This organ is always sufficiently distinct in these groups, and usually presents a laminated structure, but is occasionally composed of tubular tufts or lobes, the colour being generally of a dark olive-green. I find, however, a true hepatic organ in all the other genera examined (namely *Ascidia*, *Styela*, *Pelonaia*, *Clavelina*, and *Perophora*), quite distinct from that gland-like substance coating the alimentary tube in the first of these forms, and which has occasionally been considered to subserve the hepatic function.

This substance is of a very peculiar character, and it is difficult to say what its office really is. In all the *Ascidia* it forms a pretty thick coating over the stomach and intestine, and is composed of comparatively large globular vesicles, with thin reticulated walls, each having a large, opaque, simple or compound nucleus on one side. These vesicles have no communication with each other, though they lie in contact and are cemented together; nor are they connected with any duct, or in any way open into the alimentary tube. Blood-channels are hollowed out, as it were, amidst the vesicles; and the reproductive organs ramify throughout the agglomerated mass which overlies, for the most part, the true hepatic organ. These vesicles will therefore act as a sort of packing to the parts of these organs, and will give sup-

port and protection to them, whatever higher function they may have to perform. They may likewise assist the heart in the performance of its work by their resiliency when the mass is gorged with blood; for it is evident that, when the interstices or blood-channels are filled, the vesicles will be more or less collapsed in proportion to the pressure of the blood-current; and when the latter changes its direction the reaction will be assisted by their expansion. In our present state of knowledge, however, nothing positive can be said of the uses of this very curious structure.

The true hepatic organ, as already intimated, lies beneath this vesicular mass, and forms a thin coating on the surface of the intestine. In all the examples observed it is composed of delicate tubes, which divide dichotomously, but frequently without much regularity. At the points where the branches are given off, the tubes are usually enlarged, and the twigs terminate in rounded extremities more or less inflated. The ultimate divisions of the organ are so minute that they can only be observed by the aid of the microscope after a portion of the intestinal tube has been removed, laid open, and deprived of the mucous membrane, so as to render the tissue as transparent as possible.

In *Ascidia mentula* the dichotomous division of the tube is very obvious, and the enlargements or ampullæ at the junction of the branches are greater than usual, and they assume a triangular form; also oval enlargements frequently occur along the branches, which latter uniting go to form two long slender ducts that pass backwards within the loop of the intestine, buried amidst the vesicular substance already described, and at length open through the left wall of the stomach, about midway between the cardia and pylorus, towards the anterior margin. These two ducts come from the middle portion of the intestine; another duct, passing from the lower part of the intestinal tube, unites with one of those first mentioned, just before it sinks into the wall of the stomach. All the three ducts are exceedingly slender; and for their detection it is necessary to dissect carefully the vesicular matter within which they lie buried: when thus exposed their white walls can easily be traced, with the aid of a good lens, running amidst the comparatively dark surrounding tissue.

In *Ascidia sordida* and *A. scabra* the arrangement of the parts of the hepatic organ is similar to that in the above species; but in *A. parallelogramma* the minute structure is considerably modified. In this species there is a minute network of anasto-

mosing tubes spread over the intestine, the tubes being divided into systems by the interruption of the anastomoses along certain lines where the twigs end in blind sacs, which are occasionally a little enlarged and rounded. The main branches leading from the network exhibit a tendency to divide dichotomously, and unite to form two slender ducts, which pass at once from the intestine to the left side and close to the posterior margin of the stomach, into which they pour the biliary secretion a little in advance of the pylorus.

In *Pelonaia* there is only one hepatic duct, which is very slender, and passes in a fold of the lining membrane or "inner tunic" of Huxley, that extends from the intestine to the right side of the stomach, a little way in advance of the pylorus. Before terminating, it receives a twig or two from the surface of the stomach; so that in this genus the liver is apparently not confined to the intestine, but is also spread over a portion of the stomach. The ultimate twigs divide dichotomously with considerable regularity, and terminate in round or ovate vesicles, which are very numerous and form a distinct, opaque, yellowish layer.

The liver in *Styela* is not more conspicuous than it is in *Ascidia*. It is well developed nevertheless, and is provided with its secreting vesicles and ducts. In *S. tuberosa*, and, indeed, in all the members of this genus that have come under my observation, there is a fold of the lining membrane within the loop of the alimentary tube, which passes between the stomach and intestine. This fold is united to the pyloric end of the stomach, where there is a cæcal prolongation of that organ. The hepatic ducts lie within this fold; and before they reach the stomach, in this species, they unite to form a simple, slender duct, which opens into the left side of the cæcum. The branches of the ducts ramify dichotomously over the lower portion of the intestine, and communicate with comparatively large rounded vesicles, arranged like those in *Pelonaia*.

In *Clavelina* there is only one hepatic duct, which passes from the middle portion of the intestine, and opens into the alimentary tube immediately below the rounded stomach. The branches of the duct ramify over the intestine, dividing dichotomously, and ending in comparatively large, oval vesicles. Exactly the same form of organ is observed in *Perophora*; but in this genus the duct opens through the right wall of the stomach, near the pylorus. The hepatic organ in this interesting form was undoubtedly noticed by Dr. Lister; for he figures and describes, in his

well-known memoir in the 'Philosophical Transactions',*, "transparent vessels" ramifying over the intestine; but he does not appear to have observed the terminal vesicles, and the termination of the duct in the stomach, or he scarcely could have supposed, as he did, that the vessels he described were lacteals.

With this exception, this peculiar form of the hepatic organ seems entirely to have escaped notice until A. Krohn gave a very good description of a similar structure in a paper "On the Development of the Ascidians," published in Müller's Archiv, 1852-53†. The species examined by this naturalist was *Ascidia mamillata*; and although he appears to have traced with great accuracy the development of the organ, he seems to have failed in detecting the duct in the adult animal. From the general characters, however, obtained by his examination of the young and adult combined, he is disposed to conclude that the "secretion prepared in the cæca must be accessory to digestion; but whether or not the watery secretion is bile, and the gland therefore a liver," he concludes, "must for the present be left undecided." Nevertheless, after the above description of the numerous modifications of the organ, and particularly when the position of the duct in relation to the alimentary tube is taken into account, few physiologists will be inclined to doubt that this organ is a true liver, though low and rudimentary in structure.

The reproductive organs are well developed in the Tunicates; and in all of them the two sexes are combined in the same individual, though the male and female elements are always secreted by distinct organs, which, however, frequently compose one or more compound masses that have the parts so intimately united that careful examination is required to detect them; hence in several of the *Cynthiadae* the testis has been entirely overlooked: the oviduct and *vas deferens* are likewise constantly distinct.

In *Ascidia sordida*, the ovary is composed of numerous tubular branches, which ramify in a radiating manner over the left side of the looped portion of the intestine. The oviduct passes

* "Some Observations on the Structure and Functions of Tubular and Cellular Polypi and of Ascidiae," Phil. Trans. 1834, p. 380.

† See 'Scientific Memoirs,' edited by Hensley and Huxley, p. 328. Before I was aware of the discovery by Krohn, I had worked out the details of the hepatic organ in the genera mentioned in the text; it was therefore highly satisfactory to find his description of this organ in *A. mamillata* agree so closely with my observations, particularly in *A. mentula*.

through the loop, and, following the curvature of the intestine, opens by the side of the anus into the cloaca. The *vas deferens* terminates near to the same point, and is adherent to the oviduct throughout its course. In the vicinity of the ovary it receives several much attenuated branches from either side of the intestine; these divide dichotomously, the ultimate twigs terminating in elongated and irregularly lobulated vesicles, which are spread over the intestinal tube, and which also exhibit a tendency to dichotomous division: these vesicles secrete the male element.

In *A. scabra*, *A. affinis*, *A. mentula*, and *A. venosa* the same arrangement of the reproductive organs is apparent; but the ovary in *A. mentula* is a lobulated organ, and, lying within the loop of the intestine, is seen at both sides of the alimentary tube, and consequently has the appearance of being double; and in *A. venosa*, the male vesicles are exceedingly minute and are very numerous. In *A. parallelogramma* the genitalia have much the same disposition; the ovary, however, which is branched and lobulated, is spread out on both sides of the alimentary tube—as is likewise the male organ, the secreting vesicles of which are clustered into dendritic systems.

These organs, however, are modified to a much greater extent in the *Cynthiadae*—in many of which it is not easy to determine the parts, on account of their intimate union; and very careful examination is requisite in these cases. In *Styela tuberosa* the so-called ovaries are very numerous, and are studded over the inner surface of the mantle, on both the right and left side of the body, causing the lining membrane to bulge out. When fully developed they form protuberant, ovate, orange-coloured masses, each having at the attenuated extremity a projecting nipple-like papilla. This is the oviduct, leading out of the ovarian mass or ovigerous sac; for each mass is really a sac, in the walls of which the ova are developed. And firmly attached around the base of these sacs is a series of pale oval vesicles, which are sunk in the substance of the mantle, and which form for each sac a sort of cup within which it rests. These vesicles are the male secreting organs, and their ducts, extremely delicate tubes, pass upwards over the surface of the sac, and go to join, on the median line, a slender *vas deferens*, which, passing forward, terminates at the extremity of the short nipple-like oviduct above described. Thus it is seen that the so-called ovarian mass is a compound organ, combining both the male and female parts, each with its proper secreting organ and duct. There are therefore as many oviducts

and outlets for the male secretion as there are compound reproductive masses ; and the eggs must be shed everywhere into the space between the branchial sac and the wall of the respiratory chamber, and afterwards carried by the atrial currents to the cloaca, and so pass out, as usual, by the excurrent tube.

These reproductive masses should not be confounded with other very similarly formed bodies that everywhere stud the mantle, and fill up, to a considerable extent, the spaces between the former. These latter bodies are most frequently pedunculate, and are sometimes as large as the reproductive masses, from which they chiefly differ in colour, being pale, somewhat pellucid, and almost homogeneous in structure. They do not seem to have any high functional import, their office apparently being to form, along with the generative bodies, a sort of pad or level surface for the support of the branchial sac, which otherwise might suffer from the inequality produced by the genitalia. These peculiar organs are found in all the *Cynthiadae* that have been examined, including *Pelonaia*, in all of which the reproductive organs project boldly from the surface of the mantle.

This arrangement of the reproductive organs also occurs in *Styela mamillaris*, and in two undescribed species of the genus, recently obtained by the Rev. A. M. Norman at Guernsey. In *Thylacium aggregatum* the same disposition of these parts is also found to exist.

In *Cynthia ovata*, an undescribed species allied to *C. squamulosa*, we have a very remarkable modification of these organs. Here there are only two generative masses—one placed immediately above the alimentary tube, the other within the intestinal loop. They are elongated and fusiform, each being composed of a double parallel series of squarish nodules, in which both ovary and testis are combined. Each mass has its own proper oviduct, and *vas deferens*, which pass forward, united, between the series of nodules, and, extending a little way in advance of the organ, open into the cloaca near to the anal orifice.

But perhaps the most interesting variety of this apparatus occurs in *Pelonaia*, in which there are two elongated tubular ovaries, each being bent so as to form a wide loop ; they are attached throughout to the mantle, and bulge out the lining membrane ; one is on the right, the other on the left of the branchial sac in front of the greater portion of the alimentary tube. The oviducts advance a short way beyond the ovaries, and open into the cloaca, one on each side of the intestine, but considerably in

advance of the anal orifice. The testis is composed of numerous elongated, simple or lobed vesicles, which are placed with one end in contact with the sides of the ovaries, and are arranged in parallel order at right angles to them, fringing both sides of these organs from end to end. From the proximate extremities of the vesicles extremely delicate ducts pass across the surface of the ovary, to which they are attached, and go to join the *vas deferens* that extends along the middle line from end to end of each ovigerous organ, and, advancing along the oviduct, terminates at the extremity of that tube.

I have not met with this peculiar arrangement of the genitalia in any other species, though, after all, it is but, as it were, an amplification of that which we have seen to exist in the compound genital masses in *Stycla tuberosa* and its immediate allies. If one of these masses were greatly elongated, so as to become tubular, and if the male vesicles were increased in number, their lower extremities pulled from beneath the ovigerous sac, and stretched out on the mantle, we should have something very similar to that which subsists in *Pelonaia*.

Another modification of these organs occurs in *Stycla variabilis*, an undescribed species related to *Cynthia Canopus*, Savigny. In this the ovaries assume the form of distinct, wide, slightly undulated tubes, of which there are two on the right and two on the left side of the mantle, each having its own short nipple-like oviduct, which opens into the cloaca, there being two on each side of the anus. The testis is composed of numerous irregularly lobulated vesicles scattered over the lower portion of the mantle, in the vicinity of the posterior extremities of the ovaries, but with which they have no connexion, each separate vesicle having its own short nipple-like duct or *vas deferens*.

The reproductive organs do not exhibit any great diversity in the genus *Molgula*, the ovary and its testis being always combined, and forming one or two elongated masses, in which, however, the two component elements can always be detected by the aid of their colour and structure. The testis is composed of a vast number of branched vesicles or cæcal tubules, crowded together and sometimes assuming a dendritic appearance, while the ovary seems to be a lobulated sac, usually well filled with eggs.

In *M. conchilega* there are two such masses, placed transversely, which are generally irregular in form, but sometimes are broadly fusiform, and a little arched. That on the right side of the mantle lies upon the upper border of the intestine; the other

occupies the centre of the left side of this tunic. The oviducts are two short tubes; they pass out of the ventral or anterior extremity of the mass, and open into the cloaca on each side of the intestine. There are four or five long nipple-like sperm-outlets, situated at a little distance from each other along the body of the organ. These open directly into the atrial space on either side of the branchial sac.

A similar arrangement of the genitalia, with numerous short deferent canals, has been described by Van Beneden, in his *Ascidia ampulloides**, which is, there can be little doubt, a *Molgula*. There are two similar genital masses in *M. simplex*; but they are comparatively slender, and are pretty regularly fusiform; they are situated exactly in the same way as those in the former species; but that on the right side is overlapped by the looped portion of the intestine.

In an undescribed species obtained by the Rev. A. M. Norman in Guernsey, the genital masses are ovate, and are placed as usual, but differ from those of all other species in having the oviducts passing from their dorsal extremities, and consequently turned towards the endostyle instead of being directed to the cloaca. The products of these organs are consequently thrown into the dorsal portion of the atrium, far from the cloaca.

There is only one reproductive mass in *M. arenosa*; it is larger than usual, is of irregular form, and belongs to the right side of the mantle, but overlies to a considerable extent the alimentary tube. The oviduct, as usual, opens into the cloaca; but the *vas deferens* has not yet been observed, though the male secreting organ is distinctly visible, forming a considerable part of the mass.

In *Clavelina lepadiformis*, one of the Social Ascidians, the genitalia are placed in the loop of the intestine, near to the lower extremity of the abdomen, the ovary lying on the right of the alimentary tube, the testis being spread over both sides of it. The former resembles a bunch of grapes in which the berries are of various sizes; and the oviduct, like the stem of the fruit, is seen in the midst of the ova; and I believe I have traced it passing up the abdomen in the direction of the cloaca, but did not succeed in determining its outlet. M. Milne-Edwards, in his well-known work on the "Ascidies composées"†, states that he could

* "Recherches sur l'Embryogénie, l'Anatomie, et la Physiologie des Ascidies Simples," Mémoires de l'Académie Royale de Belgique, t. xx., 1847.

† 'Observations sur les Ascidies composées des côtes de la Manche,' p. 22.

not discover how the eggs passed from the ovary to the neighbourhood of the branchial sac, and suggests the possibility of the *vas deferens* acting also in the capacity of an oviduct. This, however, is exceedingly improbable; and, from what I have seen, there can be little doubt of the presence of a true oviduct, although I do not consider my observation a sufficient demonstration of the fact. But there can be no mistake as to the existence of a *vas deferens*; this tube is sufficiently conspicuous; passing up by the side of the alimentary canal, it penetrates the lower wall of the cloaca, and terminates by the side of the anal outlet. The testis is a much-branched organ; the branches are extremely fine, and, dividing dichotomously, terminate in numerous elongated fusiform vesicles, which are united in pairs; or, in other words, the ultimate twigs may be said to bifurcate, each branch being immediately enlarged, so as to form an elongated caecal vesicle.

The blood-system in the Tunicata is perhaps the most difficult branch in the anatomy to investigate; for these animals are generally too minute and delicate to be successfully injected, and it is not easy to obtain living specimens sufficiently transparent to permit of the blood-current being traced through the tissues. Nevertheless much good service has been done in this way by M. Milne-Edwards and others; but perhaps no one has done more by this method than Dr. Lister, who had the good fortune to meet with a species in every respect suited to the purpose. So far as I have been able to ascertain, the blood-system has been as fully, if not more fully, determined in *Perophora* than in any other Tunicate. It is therefore satisfactory to find that my results perfectly agree with those obtained by Dr. Lister, so far as they go*. This is particularly gratifying, as the mode of investigation adopted by me is very different from that followed by this distinguished anatomist; and, moreover, *Perophora* is one of the Social, while the species used by me are all Simple Ascidians.

I have relied almost entirely on dissection, aided by the accumulation of blood-corpuscles in the various parts of the system. In this way the minutest ramifications can be traced with the greatest precision. A vast number of specimens, however, are required; for many individuals may be cut up before one is met with in a proper state. Large specimens, too, are necessary; and they must have the tissues sufficiently transparent, and the blood-globules opaque or coloured; in such only can the blood-channels be distinctly traced. And when the specimens are even in the

* Philosophical Transactions, 1834, p. 375.

best condition, many may be opened before the blood-globules are found lodged in the part of the system requiring elucidation. This method is consequently very laborious; but the results are satisfactory; for in such natural injections there is very little danger of being deceived by the blood having extravasated from its natural channels.

Ascidia mentula and *A. venosa* are good species for this purpose; but the one that appears the best-adapted to this mode of investigation is an undescribed species closely allied to the former. In this the blood-globules are of a brownish colour and very numerous; so that it sometimes happens that in this animal large portions of the blood-system can be traced in a single individual. Most of the information, on this portion of the anatomy, has been obtained from these three species; but nevertheless several important points have been verified in the living animal.

The blood-system in the simple Tunicates may be looked upon as closed, how limited soever the true vascular portion of it may be. The blood-channels throughout the organism are well defined; but whether or not they are provided with proper walls, and, if so, to what extent, is not easy to determine. The trunk channels leading to and from the heart have certainly all the appearance of being true vessels; and the branchial network has likewise the character of being truly vascular. The blood-channels in the test have also distinct walls; but in this case they are apparently composed of a prolongation of the mantle or inner tunic. Traces, however, of an inner vessel may be observed in the main trunks; but this apparent vessel may be nothing more than a continuation of the lining membrane or "inner tunic" of Huxley. In fact, the so-called vascular ramifications of the test, however minute and divided, ought perhaps to be regarded as prolongations of the pallial cavity, although it is quite possible that they carry true vessels; and, indeed, from the way they are connected with the heart, this would seem almost probable.

The heart is tubular, and is of considerable length. In *Ascidia* it is attached to the lower border of the stomach, one end extending some way up the dorsal region towards the intestinal tube; this may be called the dorsal extremity; the other, the ventral end, points in the direction of the œsophagus. It lies between the mantle and the lining membrane, within a distinct chamber or pericardium, along one side of which it is attached from end to end. The chamber seems as if formed by a fold of the lining membrane; and the heart is probably coated with it in the

manner of a peritoneum, and is so attached to the wall of the chamber.

A large trunk vessel passes from the dorsal extremity of the heart, and immediately divides into three branches, one of which advances between the mantle and the lining membrane along the dorsal region at the back of the endostyle; another passes in the opposite direction down the dorsal margin to the bottom of the branchial sac. These two form the great dorsal branchial channel, and are equivalent to the ventral or thoracic sinus of Milne-Edwards; and they both communicate with the dorsal extremities of the transverse channels of the branchial sac. The third branch turns off at right angles to this great dorsal channel, close to the point where it is united to the heart, and, in company with another vessel, to be shortly described, penetrates the mantle and goes to ramify in the test.

From the other or ventral extremity of the heart there are two large trunk vessels given off, one to each side of the stomach. These ramify over the digestive organs, and supply a minute network spread over both sides of the visceral mass; this network may be termed the visceral plexus. It is in direct communication with a similar plexus of blood-channels or sinuses that lies between the mantle and the lining membrane of the right side; and this latter is continuous with another plexus similarly situated in the left side of the mantle; these together form what we shall call the pallial plexus. The trunk branch that supplies the left side of the stomach and the portion of the visceral plexus there situated divides into two large stems, one of which inclines towards the intestine, the other towards the œsophagus; the former passes for some little distance along the intestinal tube, and then, leaving it, penetrates the mantle in the dorsal region, and goes associated with the third branch from the dorsal extremity of the heart, already described, to ramify in the test. Thus originates the double vessel that carries the nourishing fluid to and from that envelope or tunic. The stem that goes towards the œsophagus passes along by the side of the lower extremity of the intestine, and, just before reaching the anus, turns aside to join a large vessel that extends along the ventral margin from one end to the other of the branchial sac. This, which is the great ventral branchial channel, is the dorsal sinus of Milne-Edwards. It communicates with the ventral extremities of the transverse branchial channels; and its lower extremity bifurcates, a branch passing on each side of the mantle.

The two great branchial channels, the dorsal and ventral, communicate with each other, as we have already seen, by the numerous transverse channels of the branchial sac; they likewise intercommunicate above through a sufficiently obvious channel that encircles the entrance of the sac, immediately above the vascular network, and just below the anterior cord, afterwards described; the lower extremities also appear to communicate with each other by a much-constricted channel. Thus the circle of the blood-apparatus would seem at first sight to be complete; and as the opposite ends of the heart operate upon the two great branchial channels respectively, and as the blood oscillates first in one direction and then in the other, we might look upon the mechanism as sufficiently perfect for all the purposes of the circulation.

But something is still wanting, as is evident when we refer to the fact that the influence of the heart is chiefly confined to the branchial organ, the visceral plexus, and the vascular system of the test. The pallial plexus of the right side is certainly in connexion, as we have seen, with the visceral plexus of that side; but, so far as our examination extends, the plexus of the left side of the mantle is connected with the general system through the minute network of the pallial plexus only. It is obvious that the blood-current would be feeble in these parts, if the whole of the mechanism is now before us. And, moreover, it would be most languid in the left pallial plexus—in that very portion of the mantle, in fact, that is most amply supplied with muscular fibres, and which, being comparatively free, has undoubtedly the greatest mobility. Indeed, unless some additional means exist to aid the circulation, engorgement of the blood-channels must inevitably take place in the pallial plexus when the heart pulsates in the direction of the viscera; and when its action is reversed, exhaustion would ensue in this portion of the system.

Now, though the branchial sac is attached to the walls of the pallial chamber in front and behind and along by the dorsal margin, it is necessary that the lateral or reticulated portions of the organ should be suspended, and in such a manner as to leave a considerable space between the sac and the pallial walls. Consequently a number of suspenders are provided, which, while they retain the branchial sac in its proper position, allow the required space. These suspenders are in the form of cylindrical bands or ties, and are contractile; they pass from the transverse branchial channels and from the great ventral channel to the walls of the pallial or respiratory chamber; they are hollow or tubular, and

are the means of communication between these blood-channels and the pallial plexus of both sides, and also with the visceral plexus of the left side. Thus the blood-currents in every part of the organism are brought under the influence of the heart. One of the suspenders, larger than the rest, connected with the ventral branchial channel, opens into a considerable channel or sinus in the mantle in which the nervous ganglion is placed; and the vessel which carries the blood from the heart to the great branchial channel has also much the character of a suspender.

There can be no doubt whatever of the fact that the branchial suspenders are tubular, and that they carry the blood, as above stated, from the branchial network to the visceral and pallial plexuses. I have seen in several instances the channels in the suspenders gorged with blood-corpuscles, as well as the channels connected with them in the pallial and visceral plexuses, and the transverse channels of the gill-sac; and thus by such natural injections the fact has been demonstrated over and over again. And, moreover, I have witnessed blood-corpuscles pass through the channels in the suspenders in young living individuals of *Ascidia sordida*.

When the heart acts in the direction of the dorsal extremity, the blood will at once be thrown into the dorsal branchial channel, and will pass by the dorsal trunk of the compound vessel into the test; all the transverse channels of the branchial sac will be filled; and through the agency of the suspending tubules or vessels the pallial plexuses of both sides of the mantle, as well as the visceral plexus of the left side, will be supplied in all directions; while that portion of the blood-current that is retained in the vascular reticulation of the branchia will be hurried into the great ventral channel, and by this to the ventral extremity of the heart. But before it reaches so far it will be joined by the streams derived from the visceral plexuses of both sides of the body, and in this way with that from the pallial plexus, chiefly, of the right side. The greater portion of the blood from the left side of the mantle will reach the heart by the ventral branchial channel, having been brought hither by the suspenders. The blood thus returned will likewise have commingled with it that which is drained from the vascular system of the test by the ventral trunk of that system. It is thus apparent that the blood which arrives at the heart in this direction is only a partially aerated current.

When the action of the heart is turned in the opposite direction,

just the reverse of all this takes place. The blood-current will now fill, in the first instance, the visceral plexuses of both sides, then the right pallial plexus; at the same time it will reach the great ventral channel of the branchial sac, and through it the transverse branchial channels; while simultaneously the blood will be pushed into the left pallial plexus through the suspenders placed along the ventral channel. The blood that now enters the vessels of the branchial sac will be joined by numerous streamlets issuing from the suspenders, and brought by them out of the visceral and pallial plexuses, and will ultimately arrive in the great dorsal channel, and so to the dorsal extremity of the heart, at which point it will be mingled with the current from the test brought by the dorsal branch of the compound vessel ramifying in that tunic—the trunk, in fact, that in the first instance carried the blood to the test. Here, then, as well as in the former case, the current returned to the heart is only in part aerated; but the aeration is undoubtedly more complete when the stream sets in this direction than in the other; for now the only unaerated portion is that from the test, while in the first case the blood from the visceral and pallial plexuses is likewise in a partially aerated condition.

The pulsations of the heart appear to vary considerably in number even in the same individual; and the numbers of the oscillations in the same direction seem never exactly to agree; neither is there any constancy as to whether the dorsal or the ventral oscillation has the greater number. In a young individual of *Ascidia sordida*, in which the movements of the heart were carefully observed, the pulsations were counted four times in each direction, and the following was the result. On the first occasion there were 73 beats in the ventral direction, 70 in the dorsal; on the second, 64 ventral, 68 dorsal; on the third, 74 ventral, 88 dorsal; and on the fourth, 63 ventral, and 64 dorsal. It required $2\frac{1}{4}$ minutes to accomplish the beats during a single oscillation. In another individual of the same species, considerably larger than the former, but still quite immature, there were 138 pulsations in one direction, and 120 in the other. Two or three of the concluding beats of each oscillation were not so vigorous as the rest; and when the action was about to change, a dead pause ensued of about two seconds.

In *Polyclinum aurantium* the pulsations were found to be 112 in one direction and 115 in the other; and on starting, the beats were slow. They afterwards became rather rapid, and before ceasing were again retarded; the action then stopped for a second

or two before recommencing in the opposite direction. The pulsations in *Botrylloides radiata* are nearly as numerous as they are in the last species. In one individual 102 beats were counted in the one direction, and 115 in the other.

The above account of the circulation will be found to agree with Dr. Lister's description of it in *Perophora*, so far as it was determined in that form; but that excellent observer did not detect the flow of the blood through the suspenders, although "filaments" attaching the branchial sac to the mantle are described and figured by him. Their function as blood-carriers seems equally to have escaped detection by Van Beneden, though he must have been aware of their existence as bands or ties; for they were figured by Savigny*, who described them as ligaments attaching the branchia to the inner tunic, and they are well known to anatomists generally. Van Beneden, however, discovered the necessity of a passage for the blood-current from the "periintestinal cavity" to the branchia to prevent engorgement when the pulsations of the heart were continued for any length of time in one direction. He therefore believed that the required communication was effected through the agency of the "respiratory tentacles"†.

It will now, however, be of no avail to discuss the improbability of such an opinion, since ample communications have been demonstrated. But it may be remarked that these tentacles are undoubtedly hollow, and that in each there is a double channel, that the blood will assuredly pass up one of them and down the other, and that it will oscillate in unison with the movements of the heart. In fact, Van Beneden states that he has seen it do so. I have observed nothing to warrant the belief that either of the channels is in immediate communication with the vascular network of the branchial sac. On the contrary, they both seem to me to open into the pallial plexus, which of course is continued into the wall of the inhalant tube.

The blood-system does not appear to vary much in the Tunicata: though certainly I have not traced it in the other genera so completely as in *Ascidia*, yet enough has been seen to warrant the above assertion. The heart is very similar throughout all the various forms examined; but its position is not by any means constant. In *Ascidia parallelogramma* it is placed on the anterior margin of the stomach, and in connexion with the left side of the mantle or inner tunic, following the removal, in this instance, of

* Mémoires sur les Animaux sans Vertèbres, pt. ii.

† *Op. cit.* p. 113.

the visceral mass from the right to the left side. In *A. intestinalis*, in which there is developed an abdominal chamber, it is doubled upon itself, and lies in this chamber towards the dorsal margin and between the stomach and the bottom of the branchial sac. The heart in *Styela* is very long, and narrower than usual; in this form it lies between the inner tunic and lining membrane on the left, and a little way from the posterior extremity of the mantle, following the curvature of, but at some little distance from, the alimentary tube. The posterior extremity opens into the dorsal branchial channel a considerable way up the endostyle; the ventral extremity is attached to the stomach, to either side of which it gives a branch in the usual manner. In *Pelonaia* the heart is likewise in connexion with the left side of the mantle, and in other respects resembles the arrangement in *Styela*. And in *Molgula* it holds much the same situation—but is placed between the reproductive mass which is above it, and a hollow cylindrical body with hard walls, the nature of which is not understood.

The branchial sac is usually more complicated than is generally supposed. Hitherto its mechanism has been spoken of in this communication only so far as was necessary to the full comprehension of the blood-system; it is now time to say something respecting its more minute structure. In all the Tunicates there must of necessity be present the two great branchial or thoracic channels (the dorsal in connexion with the endostyle, and the ventral at the opposite side of the thorax), even when the branchial sac is only partially or not at all developed; and in every instance where a true gill is present, the transverse channels or primary vessels must also exist. These latter may be considered the essential or elementary parts of the respiratory organ; the minute details, consisting of secondary vessels, are variable, even in very closely allied species, and are not always present.

The simplest form of the organ that occurs in the genus *Ascidia* is found in *A. venosa*. In this species the transverse or primary vessels, or channels, are placed at regular intervals, and scarcely vary at all in size; and between and opening into them at right angles are numerous small, longitudinal, secondary vessels divided by elongated spaces or stigmata; so that the whole forms a reticulation of vessels, in which the transverse channels are large and distant, the longitudinal ones small and numerous and divided only by narrow open spaces. Or the structure may be described, for convenience, as it frequently is, as a vascular membrane with large transverse channels and minute longitudinal

ones connecting the former, and divided by narrow elongated stigmata. This is the true aerating surface of the gill; and were there no additional appendages, the organ would appear to be composed of numerous transverse series of short longitudinal vessels and narrow openings, divided by large transverse channels or vessels; it would appear to be, in fact, what it essentially is. But on first inspection, with the aid of a low magnifying-power, it seems to be formed of a comparatively coarse reticulation of longitudinal and transverse vessels of nearly equal size, crossing each other at right angles, and having four or five narrow longitudinal openings or stigmata in each square mesh, dividing as many minute vessels.

This appearance is produced by the existence of a number of stout so-called longitudinal vessels or bars that extend from one end to the other of the branchial sac, and project considerably from the inner surface of the organ, to which they are attached only at the points where they cross the transverse channels. Here they are supported upon short wide pedicles, through which they receive their supply of blood from these channels; they are thus lifted some little distance above the general surface of the gill. At these points the longitudinal bars are a little enlarged, and have on their upper margin a stout elongated papilla with the extremity rounded. There is thus a papilla at the angles of each mesh; and they are all inclined towards the ventral side of the respiratory sac, and have on the upper surface, and in front, an elongated disk, which is apparently ciliated.

The walls of the longitudinal bars are comparatively thick; and hence these organs have a certain degree of rigidity. It is not very easy to determine of what use they are; but perhaps their chief function is to protect the more delicate tissue of the true aerating vascular surface; while the papillæ will conduce to the same end, and by the aid of their cilia probably sweep the sedimentary matters towards the oral lamina, the water being beat through the stigmata by the cilia that fringe their borders. From the stiffness of the bars themselves it may be inferred that they will also give support to, and keep stretched out, the vascular network of the sac. They seem ill calculated, on account of the thickness of their walls, to give much assistance in aerating the blood, and are certainly unnecessary as part of the circulatory mechanism.

The blood, as we have already seen, is brought to and taken from the aerating reticulation by the dorsal and ventral branchial channels, and by numerous suspenders connecting it with the

visceral and pallial plexuses. We have also traced the blood through the principal channels of the organ from one side of it to the other. All, therefore, that remains to be done is to follow the flow of the stream through the minute portions of the structure.

The extremities of the heart, we have seen, do not open into the ends of the two great branchial channels, but a considerable way above their lower terminations. It is consequently evident that the blood will move upwards in these channels above the point where it enters, and downwards below it; and when we consider the action of the current so brought to the transverse channels, it is clear that the flow will be in contrary directions in the small longitudinal or secondary vessels above and below this point. Now it has been already stated that on the reversal of the action of the heart there is a pause of a second or two, so that for this period the currents cease to move and the fluid becomes perfectly stagnant. On resuming its function, the first act of the heart is to dilate; consequently, the blood is drawn towards it from the respiratory organ; and it follows, as a matter of course, that the fluid in the secondary vessels above the point just alluded to in the great branchial channels must flow downwards, and in those below this point upwards. This will be the case whether the blood is brought to the branchial sac by the dorsal or the ventral channel. Such downward and upward set of the blood-current in the secondary vessels has actually been observed in *Perophora* by Dr. Lister, who states that "the horizontal vessels were connected also by the smaller or vertical channels between the spiracles—the set of the current in the latter being upwards for the two lower rows, and downwards for the two upper rows." If the heart in the first instance threw the blood into, instead of drawing it from, the gill, the reversal of this motion would take place; namely, the flow in the secondary vessels above the point indicated would be upwards, and downwards below it.

Such are the characters of the branchial sac as seen to exist in *A. venosa*. The minute network, however, is not continuous throughout the whole organ, but is interrupted in such a manner as to show that it is composed of two lateral lobes or laminae. It is divided along the dorsal line by two parallel folds of the lining membrane, which are separated by a deep groove; the tissue at the base of each fold is stiffened by a flattened rod of a somewhat rigid, opaque, yellowish substance, which together form the endo-style, that lies, as it were, in the bottom of the groove, along which the rods appear to be united. The upper extremities of these

folds diverge right and left, and become continuous with the lower member of what may be termed the anterior cord or collar—two narrow folds also of the lining membrane that encircle the base of the respiratory tube, a little above the anterior margin of the branchial sac, and having the circular blood-channel, previously mentioned, immediately below them. The ventral margin of the sac is furnished with a wide, longitudinal, delicate, membranous fold, which apparently also originates in the lining membrane, and which interrupts the continuity of the minute network in this direction. This is the ventral or oral lamina; it extends from end to end of the branchial sac, and is ribbed transversely; the margin is entire. The mouth opens close by its left side, about one-third from the lower extremity; the upper extremity for some little way downwards is divided longitudinally, showing that the lamina is really composed of two lateral membranes; and each division is united to the lower member of the anterior collar, much in the same manner as the latter is attached to the dorsal folds connected with the endostyle. The upper member of this collar is divided from the lower by a narrow groove, and is uninterrupted by either the oral lamina or the dorsal folds. The oral lamina is connected below by another narrow cord to the posterior extremity of the dorsal folds: this is the posterior cord.

In this way are traced the boundaries of the two lateral laminæ composing the branchial sac. They are attached by their upper borders to the walls of the pallial or respiratory chamber, a little below the anterior collar or cord; the dorsal margins are attached along the sides of the endostyle, and the lower margins along the line of the posterior cord. In all other parts the two lobes are free, except at the points where the suspenders bind them to the walls of the chamber, and where the extremity of the œsophagus penetrates the branchial sac; and here, of course, the latter is attached to the alimentary tube. The supposed function of the endostyle has been already indicated; the folds of the lining membrane to which it is adherent are no part of the gill; neither can the oral lamina be considered a portion of the breathing-organ: it is certainly highly vascular; that is, minutely ramifying blood-channels can be traced in it; but similar vessels (or channels) are seen in all the membranes of the organism, and also occur in the dorsal folds in connexion with the endostyle. The office of the oral lamina is to conduct the food to the mouth. And it has already been stated that the sedimentary matters are there accumulated and formed into a cord, and so carried to the oral aper-

ture along the lamina. The anterior cord may perhaps also aid in collecting sedimentary aliment, if it be ciliated, as its homologue in *Salpa* is stated by Professor Huxley* to be.

The simple form of gill above described is not by any means constant in *Ascidia*; in fact it seems but rarely to occur in this genus. The same simplicity of structure, however, is found in *Pelonaia*, with only some unimportant changes. In *Clavelina* and *Perophora* the vascular network is not more complicated; and in the former, at least, the longitudinal bars have entirely disappeared. And in it there are numerous transverse laminae which are adherent throughout to the walls of the transverse channels; they are united to the filaments of the oral lamina, and perhaps are mainly instrumental in carrying the food in that direction. The structure of the gill is equally simple in the compound Tunicates; and in them the longitudinal bars seem to be occasionally present.

In *Ascidia mentula* and *A. sordida* the branchial network is fundamentally the same as in *A. venosa*; but in the two former, and in some others, it is minutely folded longitudinally, so that, on making a transverse section of it, the edge presents a deeply undulated line. The surface is not altogether unlike corduroy; it is, in fact, finely plaited (or crimped, as the laundress might say); but the flutes or grooves between the ridges or plaits are interrupted wherever the transverse vessels cross them, the vessels at these points filling up the hollows. Thus there are numerous septa formed, turning the grooves into series of minute recesses or pouches.

The longitudinal bars are strong and raised considerably above the inner surface in *A. mentula*; and there are smaller intermediate papillae, as well as larger ones at the points where the bars cross the transverse vessels. All the papillae bear ciliated disks; and a wide membrane stretches from the back of the larger papillae for a considerable way along the transverse vessels. In *A. sordida* the bars are likewise strong; but the papillae are rather small, and there are no intermediate ones. Between the longitudinal bars there are two oval ciliated disks, one on either side of the middle line of the transverse vessels.

The oral lamina in *A. sordida* is a wide plain membrane; but in *A. mentula* it is strongly ribbed transversely; the ribs passing beyond the margin as fine points give to it a pectinated appearance.

* "Observations upon the Anatomy and Physiology of *Salpa* and *Pyrosoma*," Phil. Trans. 1851, pt. 2. p. 567.

In *Styela tuberosa* and its immediate allies we have another modification of the branchial network. In them it is provided with eight simple longitudinal folds or laminae—four on each side of the oral lamina; these stretch from one end of the sac to the other, and terminate below by the sides of the oral orifice. The network is, in other respects, as simple as it is in *A. venosa*, there being no minute plaiting such as is seen to exist in *A. mentula*. The folds, however, give to it a very interesting character, inasmuch as we observe in them a very ready and efficient mode of increasing the aerating surface, as, indeed, the same end is gained by the minute plaits in the vascular network in *A. mentula* and *A. sordida*. In *Styela* the folds are formed in exactly the same way as those minute plaits; that is, they are each composed of a fold of the branchial sac, and the space within is divided into pouches by septa situated at nearly equidistant points. In this genus the transverse vessels vary considerably in size, there being usually one or two smaller between larger ones; and the septa are placed wherever the latter cross the structure. Thus a series of pouches of nearly equal size occupy the interior of the folds, and open at the outer surface of the branchial sac into every part of the atrium. In fact, we see here an arrangement very similar to that observed in the interbranchial water-channels in the Lamelli-branches; and in this case, as in them, the purpose is to allow the water, after permeating the walls of the fold or lamina, to escape externally.

The longitudinal bars in *Styela* assume the form of delicate ribbon-like membranes attached by one edge to the principal transverse vessels; they are numerous, and are found on the folds as well as on every other part of the organ. The oral lamina is a wide simple membrane.

The branchial sac in *Molgula conchilega* and its allies is characterized by longitudinal folds or laminae, formed much in the same way as those in *Styela*. In the former there are six such folds on each side of the sac. The vascular network, however, is very different, having the secondary vessels, or those which are usually arranged at right angles to the transverse channels, disposed in imperfect spiral coils or convolutions, the vessels themselves frequently intercommunicating; consequently the stigmata or open spaces separating them are broken into various lengths. There are also a few delicate radiating vessels which pass from the centre of the coils to the circumference, but mostly in the direction of the transverse channels that convey the blood to and from the

coils. The chief purpose of these radiating vessels is apparently to prevent engorgement of the coil, and to aid the reflux of the stream by conveying the blood in the most direct manner to and from the centre of the coil. When the spiral arrangement is more imperfectly developed than usual, the radiating vessels are very irregularly dispersed; but even in such cases there can be little doubt that their function is as above stated. The longitudinal bars have the ribbon-like character of those in *Styela*, and are principally confined to the folds.

Ascidia parallelogramma has also the secondary vessels spirally arranged, as originally pointed out by Mr. Alder*; and here the coils, which form slight conical eminences, are disposed in regular transverse series between the transverse channels. The coiled vessels do not so frequently intercommunicate as they do in *Molgula*; consequently the stigmata are much longer, being less interrupted. The radiating vessels are not numerous, and they pass from the centre of the coil to the transverse channels. The longitudinal bars are more rigid and cord-like than usual; they project considerably from the surface of the gill; and the papillæ which are attached to them are not elevated, but inclining backwards are united throughout their length, and give support to wide membranes that extend from the surface of the transverse vessels. In this species the oral lamina is replaced by a series of well-developed filamentous processes.

The most perfect, however, of the spiral type of gill is found in *Molgula arenosa*. In this interesting species the interior of the branchial sac is furnished on each side with six or seven wide, longitudinal, ribbon-like bands, which are attached by one edge to the transverse vessels at the points where they cross them. These bands, how like soever in general appearance, are not to be confounded with the branchial folds in *Styela* and *Molgula*; they are the homologues of the longitudinal bars so constantly present, and with the transverse vessels give to the surface a coarse reticulation, the square meshes of which are each occupied by a conical eminence. On account of the prominence of the longitudinal bands these eminences, which look like so many miniature beehives, seem to be arranged in six or seven longitudinal series. Each cone is formed of a double spiral coil of secondary vessels united at the apex; the coils are perfect, and the stigmata, which are coextensive with them, appear to be scarcely, if at all, inter-

* "Observations on the British Tunicata," Ann. & Mag. Nat. Hist. S. 3. vol. xi. p. 158.

rupted by intervacular communications. Radiating vessels, however, which are sufficiently numerous to prevent engorgement, pass from the apex of each cone to the transverse vessels, and are the principal interruptions to the continuity of the spiral stigmata. The oral lamina in this, as in all the members of the genus, is a plain simple membranous band.

All the simple Ascidians that have come under my notice, not even excepting *Pelonaia*, have a collar of tentacular filaments situated at the base of the incurrent tube, some distance above the entrance of the branchial sac; indeed the distance in some species is considerable, and no instance has occurred in which they could be said to be connected with the gill. They are usually linear or slightly conical, and are rather numerous, except in *Pelonaia*, which has not more than twelve or fourteen; but in *Molgula* and in some of the other *Cynthiadæ* they are branched or pinnate, and are not very abundant. They, however, all agree in being soft, delicate, hollow organs; and the simple ones, at least, have the interior divided by a septum into two longitudinal channels, so that the blood will circulate freely through them. They appear to be an outgrowth of the lining membrane, and are supplied with blood from that which flows between it and the mantle or inner tunic.

That enigmatical organ the branchial tubercle (the anterior tubercle of Savigny) is situated in the space between the tentacular filaments and the anterior margin of the branchial sac, in contact with the upper membrane of the anterior cord or collar, and immediately in front of the upper extremity of the oral or ventral lamina. It is formed of two parallel folds of the lining membrane pressed close together and united at the extremities; they seem but as one fold, and are bent into a loop with the ends turned towards the inhalant orifice, and, inclining inwards, are a little convoluted. Thus the organ assumes a rounded or oval form, rising above the surface to which it is attached as a depressed compact tubercular swelling. An opaque white line marks the separation of the two folds, and follows the convolutions to the extremities.

This is the form that this curious tubercle assumes in *Ascidia scabra*, *A. affinis*, a closely allied species, *A. mentula*, and *Pelonaia corrugata*. In *A. sordida* one of the extremities turns inward, the other outward, so that both are bent in the same direction. But more striking modifications occur in some other species. In one allied to *A. mentula* there are three loops, crowded upon each

other, and having their extremities only slightly incurved; and in another closely related form the organ is dense, large, and somewhat quadrangular, with numerous irregular convolutions formed apparently of several loops of the lining membrane. In *Styela tuberosa* and *S. mamillaris* it is large, oval, and disk-like, with the extremities so indistinct as to be scarcely traceable. The reverse of this is the case in *Molgula conchilega*, in which it is almost crescent-formed, with the extremities very obvious and well turned inwards. And in *Ascidia venosa* it is still more simplified, being a mere horseshoe-like loop, with the extremities pointed and very slightly incurved.

It is not easy to assign a function to this peculiar organ—though, from its position at the entrance to the branchial sac, it may be inferred that it is of the nature of a special sense, testing the quality of the inhaled water. Taste could be of little use to an animal that has not the power of selecting its food; but it would seem necessary for the creature to be warned of the approach of aught deleterious in the respiratory currents. The function of this organ is therefore probably more akin to that of smell than of taste. It is certainly of some importance in the economy of the animal; for it is constantly present, and is usually closely associated with the ganglion. In some species the tubercle rests upon the nervous centre; and when placed at a little distance from it, a nerve may generally be traced running towards (and in some instances having all the appearances of supplying) it.

The nervous system is in a very rudimentary condition in the Tunicata. There is but one ganglion; and it is invariably placed between the two respiratory tubes, in a blood-sinus situated between the inner tunic and lining membrane, which sinus, communicating directly with the great ventral channel of the branchial sac, will be well supplied with aerated blood. The ganglion is fusiform, more or less elongated in the antero-posterior direction, and usually a little constricted in the middle, as if composed of two centres. In *A. mentula*, and in several other species that have been examined, it is partially folded in a much folliculated gland-like substance, and gives off from each extremity three or four nerves, all of which go to the respiratory tubes and to the adjacent portions of the inner tunic or mantle. A branch from one of the principal nerves has been traced to the branchial tubercle in one or two species. There is no variation of any consequence in the nervous element in any of the forms examined.

The organization of *Salpa* is highly instructive; for in this

form we have a Tunicate in which development has been arrested, and which, to a certain extent, has an embryonic character. In it the branchial sac is entirely absent, and the circulatory system is much in the same condition as it is in the young of *Ascidia* before the respiratory organ is developed.

In *Salpa* the outer tunic or test appears to be quite free from the inner tunic or mantle, except at the margins of the anterior and posterior orifices, where they seem to be united. The inner tunic and lining membrane, or that which forms the inner wall of the respiratory cavity, are, on the contrary, adherent throughout, spaces only being left for the passage of the blood-currents; for it is between this tunic and membrane that the "sinus-system" is situated. The respiratory cavity corresponds pretty accurately to the pallial chamber of a simple Ascidian—were the branchial sac entirely removed, leaving only the endostyle with its two lateral folds, the ventral or oral lamina, and the connecting cords.

On examining the great respiratory chamber or cavity in *Salpa spinosa*, for instance, an endostyle with the two lateral membranous folds, similar in all essentials to that organ in the other Tunicata, is seen adhering to the dorsal wall of the cavity; and the so-called "branchial band" or "gill" is conspicuous on the opposite side, passing forward from the nucleus in an inclined position, the posterior extremity being attached in the vicinity of the mouth, the anterior to the ventral wall of the cavity. The two folds in connexion with the endostyle and the "branchial band" are connected in front by a narrow band (the "ciliated band" of Huxley) that encircles the anterior extremity of the respiratory cavity: and another similar band, or pair of parallel bands, passes from the posterior end of the dorsal folds, and terminates near to the posterior extremity of the "branchial band." Thus we observe certain lines or bands which, together with the endostyle, correspond to the boundary lines of attachment of the branchial sac of a simple Ascidian; and if we suppose a vascular network extended from either side of the endostyle to the lateral margins of the "branchial band," and imagine it to be attached in front and behind along the ciliated bands, we shall see how readily a *Salpa* may be made to assume the most striking feature of an ordinary Ascidian.

Now the ciliated bands are the homologues of the posterior cord and the lower member of the anterior cord or collar of the branchial sac of the simple Ascidians; and the "branchial band" is the equivalent of the oral or ventral lamina of the same group. The relation of the ciliated bands, particularly the anterior, to the

"branchial band," and the characters of the latter, sufficiently prove this.

The so-called branchial band has the appearance of a cylindrical tube; but it is easily seen that it is formed of two laminae, the lower or ventral margins of which are a little separated, while the upper or dorsal are brought together, forming a ridge along this margin. A large blood-channel runs along in connexion with, and immediately below, the ventral margins; this is the homologue of the ventral branchial channel. The two laminae rise, as it were, from the sides of this channel, and inclining towards each other, are united along the dorsal ridge as just stated; but towards the anterior extremity of the organ they separate, and become united to the ends of the ciliated cord or band in exactly the same way as the lateral divisions of the oral lamina join the anterior cord or collar. In fact, in both *Salpa* and *Ascidia* the one organ seems to be a continuation of the other, as they are, no doubt in both, productions of the lining membrane, the blood-channel itself being developed in connexion with the same membrane. The "branchial band," we thus see, corresponds to the oral lamina in being composed of two laminae, in its relation to the anterior ciliated band or collar, and in its connexion with the great ventral blood-channel. And, moreover, like the oral lamina in several of the *Ascidia*, it is transversely ribbed. In *Salpa* the ribs are stout and strongly ciliated; and there can be no doubt they are also ciliated in *Ascidia*.

In *Salpa*, then, the so-called branchial band cannot be looked upon as a true gill; and homologically it does not represent the branchial sac at all, but only that appendage of it the oral lamina. And as the function of the latter seems to be chiefly, if not exclusively, to carry the food to the mouth, the same office is probably performed by the so-called gill in *Salpa*. And, indeed, without some such help it is difficult to see how such an animal would be able to take its food. There can be little doubt that the walls of the respiratory cavity, as has been suggested by Professor Huxley*, chiefly effect the decarbonization of the blood; while the so-called gill will aid in this operation in proportion to its vascularity; as must, indeed, all the tissues bathed by the respiratory currents.

The ganglion lies on the ventral side of the respiratory cavity, between the lining membrane and inner tunic, a little in advance of the ciliated band, and directly in front of the anterior extremity

* *Op. cit.* p. 570.

of what we may now term the oral lamina (the pseudo-gill). All the nerves are given to the walls of the cavity—in other words, to the inner tunic or mantle. The anterior extremity of the ganglion is produced a little, giving an appearance to the organ as if composed of two centres. On the anterior surface of the produced extremity there are three or four imperfectly formed black pigment specks, having the appearance of rudimentary eyes, which, however, Professor Huxley considers auditory capsules.

The “languet,” with its ciliated “fossa,” is placed just in front of the ganglion, consequently on the same middle ventral line with it and the oral lamina; it is a long, tapering, conical process, with a longitudinal groove which widens at the base where it joins the fossa, over which it seems to straddle. There can scarcely be any doubt that this is an organ of special sense; and it would appear probable that its office is to ascertain the quality of the respiratory currents, and may therefore be olfactory. Thus in function the “languet” would seem to agree with the branchial tubercle so constant in the other Tunicates; but it is, moreover, homologically speaking, the same organ, as appears demonstrated by its position in relation to the ganglion, the ciliated band, and the pseudo-gill. Like the tubercle, too, it is a production of the lining membrane; and, as indicated by the longitudinal groove, like it, also, the “languet” is probably formed of two portions or folds of this membrane. It must, therefore, not be confounded, as it frequently has been, with the tentacular filaments of the oral lamina in *Clavelina*, *Pyrosoma*, and several other simple and compound Ascidians.

The homologies, however, do not stop here; the clear anastomosing vessels or tubes ramifying over the surface of the intestine, described and figured by Prof. Huxley*, and supposed to “represent a hepatic organ,” or “a sort of rudimentary lacteal system,” are, there can be no doubt, the homologue of the rudimentary liver before described in *Ascidia* and in some of the Cynthiadæ; and, indeed, the structure appears to resemble very closely that of the hepatic organ in *Ascidia parallelogramma*. The “mass of clear cells,” the “elæoblast” of Krohn, according to Huxley, may perhaps prove to be the same as the well-known cell-structure before described as coating the alimentary tube in the *Ascidia*; but this is mere conjecture.

Thus we see how close the relationship is between *Salpa* and *Ascidia*; with *Clavelina*, however, the connexion is still more intimate. This is undoubtedly a near ally; it is only necessary to

* *Op. cit.* p. 570.

look to immature specimens to be satisfied of this. When the young *Clavelina* is about one twentieth of an inch long, and when the thoracic portion would scarcely be half that length, the thorax is remarkably like the embryo of *Salpa*. In profile both have a subtriangular form, the anterior opening being placed at the angle in front, and the posterior at an angle situated considerably backward, the young of *Clavelina* having the two orifices nearly as far apart as they are in the embryo of *Salpa*. At this early period of growth the endostyle is distinctly developed in both forms, and the ganglion and the oral lamina are clearly indicated, also the ciliated band or anterior collar. So far, everything is alike; the general similarity of the respiratory cavity is obvious enough; and were the nucleus in *Salpa* produced a little more than it is backwards, the resemblance of the two would be almost complete. But in the young of *Clavelina* there are, in addition to what has already been described, the tentacular filaments of the incurrent tube, which are now of considerable size; and the branchial sac has already commenced its development.

The latter organ, however, is in an exceedingly rudimentary condition: only a single transverse channel or primary vessel on each side of the great ventral channel has made its appearance, and does not yet extend much more than halfway across the thoracic or respiratory cavity, on its way (so to speak) to the dorsal channel in connexion with the endostyle. On each side of these growing primary vessels five or six secondary vessels, at right angles to them, have commenced to sprout; and the distal extremities of all of them, as well as of the primary vessels themselves, open through the lining membrane of the thoracic cavity into the sinus-system between it and the inner tunic. Thus is defined, on either side, the nascent atrium, which is only an extension of the cloaca that had been previously formed. Shortly another primary vessel makes its appearance, extending from the ventral channel and connected laterally with the extremities of the secondary vessels already formed; and then another series of secondary vessels is developed, and afterwards another primary vessel, and so on, gradually increasing the length of the two branchial leaflets (if they may be so called), which at the same time grow in breadth, passing further and further across the thoracic cavity until at length they reach the sides of the endostyle; all the while the primary and secondary vessels along the margins of the growing organ, open into the pallial sinuses in the manner already indicated; so that the boundary of the water-space or atrium is well defined, and is always

coextensive with the expanding gill. The oral processes, which in this animal occupy the place of the lamina, are produced one by one, in accordance with the appearance of the primary vessels; and the vascular suspenders likewise originate at the same time.

It is unnecessary on this occasion to trace the development of the branchial sac further, or with more minute details; it should be observed, however, that the growth of the gill undoubtedly originates in the great ventral channel, which is itself a production of the lining membrane, and that during the development of the organ it is connected with this membrane, and that this connexion is ever afterwards maintained by the vascular suspenders. It may also be remarked that in no stage of the growth is the gill ever connected, on the one hand, with the margin of the oral orifice—or, on the other, with the tentacular filaments of the incurrent tube, which are, indeed, placed at a considerable distance from the upper margin of the gill; and the lower margin is some way above the oral orifice.

The above description of the development of the gill does not exactly agree with that given by A. Krohn of the branchial sac of *Phallusia* (*Ascidia*) *mamillata**. According to this author, there are at a very early stage of development two excurrent orifices, one on each side of the middle line,—necessitated by the fact that the gill commences to separate itself from the walls of the cavity at two points simultaneously, thus forming two separate water-spaces, one on each side of this line,—the great ventral blood-channel apparently not being yet detached from the inner tunic. It is not till the “branchial sac is everywhere perforated” that these water-spaces, according to this naturalist, are united by the formation of the cloaca. I have certainly not seen the young of *Clavelina* in a sufficiently early stage of development to warrant the assertion that such does not take place in this form; but assuredly in it, at a very early period, the cloaca freely communicates with the water-space or atrium on each side. At the same time it must be allowed that it is more than probable that, at the earliest stage of existence, in *Clavelina* and in other Tunicates the great ventral channel is united throughout to the wall of the palial chamber; and hence the statement of Krohn does not seem at all unlikely. And, moreover, we thus learn that this great blood-channel is developed in connexion with the lining membrane, with which it continues ever afterwards more or less connected. We have already seen that the transverse or primary vessels take their origin in this same vessel, and that they in their turn give

* “On the Development of the Ascidians,” by A. Krohn—‘Scientific Memoirs’, edited by Henfrey and Huxley, 1853, p. 324.

off the secondary vessels: these are the essential parts of the branchial tissue; and when we look to its anatomical structure as well as to its mode of growth, we can scarcely doubt that the network of the gill is truly vascular. Speaking, therefore, of the branchial sac as a perforated membrane, as is frequently done, gives an erroneous idea of its apparently true nature.

The longitudinal bars which have been so frequently alluded to, and which lie in a plane a little above the inner surface of the respiratory sac, are non-essential parts of the organ, their function apparently being, as previously stated, to protect the surface of the gill, and, by the aid of their cilia, to sweep the alimentary matters towards the oral lamina. They are not always developed: they do not exist in *Clavelina*; neither are they apparently present in *Perophora*; and they seem to be absent in several of the compound Ascidians; in *Doliolum* they have likewise disappeared.

It is stated above, that *Clavelina* is nearly related to *Salpa*; but *Pyrosoma* and *Doliolum* come much nearer to it in their general structure, as well as in the details of their organization. Unfortunately I have never seen either of these two interesting forms; but, judging from the able descriptions of them by Prof. Huxley in the 'Philosophical Transactions,' they both present examples of imperfectly developed gills. In *Pyrosoma* the secondary vessels are entirely absent, and the primary vessels of the two lateral laminae of the branchial sac do not reach the endostyle, their development having been arrested before they extended so far across the respiratory cavity; their distal extremities, however, will undoubtedly open into the system of pallial sinuses; in no other way can the flow of the blood through the gill be explained: the circulation is therefore to this extent embryonic. "The longitudinal bars" of Huxley are the homologues of what have been so designated throughout this communication, and are therefore not to be confounded with the true vascular portion of the gill. To turn *Pyrosoma* into a *Salpa*, little more seems necessary than to arrest entirely the growth of the primary branchial vessels, and to give to each individual a separate test.

An arrest of development of these vessels is carried to a much greater extent in *Doliolum*. In this form the secondary vessels have not only disappeared, but the longitudinal bars are also absent, and the primary vessels themselves only very imperfectly developed. The two bands named by Huxley respectively the "epipharyngeal" and "hypopharyngeal" in this curious form, undoubtedly indicate the line of the great ventral channel and

oral lamina, bent up in accordance with the peculiar development of the creature. In the *Ascidie* that have the branchial sac prolonged behind the mouth, the ventral channel extends likewise behind the mouth, as well as in front of it; and if we suppose the endostyle to be shortened in these species, and the posterior portion of the sac to be consequently drawn backward and upward, the corresponding extremity of the ventral channel would pass up the dorsal side of the pallial or branchial chamber; and thus this axis of the gill would at once take up the position it occupies in *Doliolum*: that is, part would be above or in front, and part below or behind the mouth; part would form a "hypopharyngeal" band, and part an "epipharyngeal" band.

Now the primary vessels or "tubular bars" originate in the sides of these bands, and are, as already stated, very imperfectly developed, extending, as they do, only for a short distance, and then terminating by opening through the lining membrane of the respiratory cavity into the pallial sinuses, just as we have supposed the similar vessels do in *Pyrosoma*. The vessels or "bars," however, of the middle portion of the gill, according to Prof. Huxley, do not so terminate, but end in free loops. The branchial sac is, indeed, in such a rudimentary condition that one step more in its degradation and it would entirely disappear, and *Doliolum* would be scarcely distinguishable from *Salpa*.

In *Appendicularia* the gill is wholly absent; but the oral lamina is represented by the "ciliated band," which adheres to the ventral surface of the respiratory cavity; and it is interesting to find that the anterior extremity of this band divides into two branches, which, passing towards the dorsal region, encircle the cavity a little below the ganglion, just as the anterior ciliated band does in *Salpa*, as the anterior band or collar does in *Ascidia*.

In this interesting form, in which the embryonic characters have become permanent, we see the oral lamina still adhering to the wall of the respiratory cavity, as well as the endostyle and anterior collar or ciliated band. All these parts, then, appear to be equally developments of the lining membrane; and the gill, which in the higher forms has been described to originate in the oral band, or rather in the great ventral channel, which always accompanies it, must likewise be considered a production of this same membrane, and which, too, we have seen it is connected throughout its development.

It is not my intention, on the present occasion, to enter at any length on the relation that subsists between the Tunicata

and the Polyzoa on the one hand, and the Tunicata and the Lamellibranchiata on the other. Nevertheless it seems desirable to say a few words on this important branch of the subject before concluding, with the view merely of indicating what appears to be the result, in this respect, of my recent investigations.

That the Polyzoa are very closely allied to the Tunicata is now generally admitted; opinion, however, is divided respecting the homology of the tentacular crown—some naturalists maintaining that it is represented by the branchial sac, while others believe that it is homologous with the tentacles of the respiratory tube, and that the branchial sac is really the dilated pharynx of the polyzoon. These two views have been ably advocated respectively by Prof. Allman and Prof. Huxley.

In my paper on the "Freshwater Bryozoa," before cited, the opinion that the branchial sac is homologous with the tentacular crown was maintained; but my belief in this view has been of late much shaken, and even Prof. Allman's ingenious explanation of his theory seems to me no longer satisfactory. The peculiar idea entertained by this able physiologist is, that the lophophore of a Hippocrepian Polyzoon is the homologue of the ventral branchial channel of the Ascidian, and that the tentacles of the former correspond to the transverse or primary vessels of the branchial sac. But the lophophore is an appendage of the mouth, and is developed from the margin of the oral orifice, and therefore can scarcely be considered to be the true representative of the branchial channel, which does not seem to be so related, but appears rather to be developed in connexion with the lining membrane coating the pallial cavity, and has all the appearance of a true vessel in direct communication with the heart. And there are other difficulties in the details of this view, to which it is unnecessary, at this moment, to make further allusion.

The view so forcibly advocated by Prof. Huxley seems to rest more upon a wide and philosophical generalization of Molluscan organization than on anatomical and embryological data, and is therefore difficult to discuss from a standpoint of the details of such matters. It must, however, be stated that the anatomical facts, so far as I have been able to examine them, do not seem to contradict this hypothetical view; indeed, in many respects, they appear rather to support it. The anatomical data, nevertheless, will, I think, bear another interpretation, which, perhaps, it will be well to consider, merely premising that I have no wish to support it further than as a suggestion which has a few cor-

roborative facts in its favour: more information is still required before this matter can be determined satisfactorily. The interpretation alluded to is, that the branchial sac is a new and distinct development, as the endostyle is, and as are the oral lamina, the branchial tubercle, and the tentacular filaments of the inhalant tube,—and that all these organs have equally their origin in the lining membrane or inner tunic of Huxley, and have no homological representatives in the Polyzoa.

And, further, this interpretation of the facts leads to a belief that the branchial sac is the rudiment of the Lamellibranchiate gill, the structure of the two organs being essentially the same. The principal blood-channels in the gill of the Lamellibranch are simple transverse vessels; and the most persistent and essential parts in the structure of the branchial sac of the Tunicates are the transverse or primary vessels. Thus, fundamentally, these organs are similar. And when the branchial sac is furnished with longitudinal folds, as generally is the case in the Cynthiadæ, the primary vessels assume relatively the same position as their supposed homologues do in the gill-plate. The folds, too, as the nature of the structure implies, are formed of two laminae united at their distal margins, and have the space between them divided by septa into transverse pouches, which only want to be elongated by the further development of the fold to make them correspond in every respect to the interbranchial water-tubes of the gill-plate of the Lamellibranch. And already the pouches subserve the function of water-tubes.

Now we have seen that the branchial sac is composed of two lateral laminae, originating in the great ventral channel, and extending to the endostyle; and in *Pyrosoma* and *Doliolum* we observe that these laminae are curtailed in their development before they reach so far; in the latter, in fact, they are exceedingly limited. There is, therefore, no difficulty in supposing that the branchial sac might be reduced to merely four such folds as above alluded to, two being on each side of the mouth and oral lamina. Were such the fact, there would be four rows of orifices, corresponding to the pouches in the folds on the outside of the gill, opening into the cloaca, exactly like the four rows of openings of the interbranchial water-tubes communicating with the anal chamber in the Lamellibranchs. Thus, in all external characters, we should have here a very complete representation of the four gill-plates of that group. Each pair of the gill-plates, however, in the Lamellibranchiata has its own proper efferent

blood-vessel leading directly to the heart; while our supposed transformed organ has only one such trunk vessel. It would therefore seem probable that the branchial sac can represent but a single gill of the Lamellibranch, and that one fold on each side of the ventral lamina (or great ventral channel) may be assumed to be the homologue of the left gill of the higher mollusk.

The branchial sac itself is not a perfectly symmetrical organ; at least the oral lamina does not exactly divide it into two equal lateral halves; for it invariably passes to the right of the oral aperture in all dextral species, and it never, so far as my observations extend, abuts directly upon it. On the other hand, the heart in the simple Ascidians usually occupies a central position, being placed in the middle line of the digestive organs; and the great vascular trunks as they leave its anterior or ventral extremity, exhibit a symmetrical bilateral development, a trunk going to each side of the visceral mass, and there ramifying over these organs. That, however, on the left side sends a large branch along by the side of the intestine to the great ventral channel of the gill; while the corresponding branch of the right side dies out before reaching the opposite margin of the visceral mass. Here, then, ceases the bilateral symmetry of the vascular organs; were it carried a little further, there would exist two ventral branchial channels; and thus a right pair of gill-plates might be developed, one fold being on each side of the channel; and in this way the respiratory organ would be exactly similar in all essential characters to that of a Lamellibranch. And if the roots of the two lateral trunks that proceed from the heart were dilated into auricles, the rudiments of the Lamellibranchiate heart would also be established. This idea of an arrest of a bilateral growth is somewhat strengthened by Krohn's description, already quoted, of the development of *Ascidia mamillata*, in which the young at first has two distinct lateral atrial spaces and two lateral excurrent orifices; the spaces ultimately coalesce, as do also the orifices, the tendency to bilateral development terminating at a very early period.

If this view of the homologies of these organs be correct, then the cloacal, or that which has been uniformly designated throughout this communication the ventral surface, will correspond to the dorsal region of the Lamellibranch; and consequently the opposite margin will be the ventral aspect, and the so-called right and left sides will have to interchange appellations. Thus the excurrent tube will become dorsal, and the incurrent ven-

tral, as they are in the Lamellibranchiata, and, without any great disturbance of the parts, all the viscera will assume their proper positions.

Before the probability of this determination of the homological relations can be admitted, it is necessary to ascertain the true nature of the ganglion, which, as we have seen, is placed between the respiratory tubes. In the Polyzoa the ganglion is placed on the rectal aspect of the œsophagus, immediately below the mouth, and gives its nerves to the tentacles and to the œsophagus in the direction of the mouth, but none to the "endocyst" (mantle) or to any other organ. Therefore it can scarcely be homologous with the ganglion in the Tunicata, which distributes all its nerves to the walls of the respiratory tubes (which are mere prolongations of the mantle) and to the mantle itself. In the Lamellibranchs, however, there is a ganglion (or a pair of ganglions), namely the branchial, the most constant in these animals, situated upon the posterior adductor muscle, which, besides supplying the gills, gives nerves to the dorsal portions of the mantle and to the respiratory tubes, parts which are the undoubted homologues of those which receive the nerves from the ganglion in the Tunicata. It therefore seems impossible to avoid the conclusion that the ganglion in the latter is the true representative of the branchial ganglion in the Lamellibranchiata: ganglia supplying homologous parts must likewise be homologous.

This determination of the nature of the ganglion agrees well with its position, which in relation to the respiratory tubes is almost precisely similar to that of the branchial ganglion. And we thus find in the nervous element a corroboration of the above suggestion as to the homological relation of the branchial sac.

Notes on some Insect- and other Migrations observed in Equatorial America. By RICHARD SPRUCE, Esq. Communicated by the President.

[Read June 6, 1867.]

IN endeavouring to trace the distribution of plants in the Amazon valley, and to connect it with that of animals, I have been struck with the fact that there are certain grand features of the vegetation, which prevail throughout Cisandine America, within the tropics, and even beyond the southern tropic,—features independent of the actual distribution of the running waters, partly also of the

geological constitution, and even of the climate—to which the range of the larger Mammals and Birds corresponds in a considerable degree, but not that of any one class or tribe of animals, and especially not of lepidopterous Insects. These features depend on the prevalence of certain groups, or even of single species, of plants over vast areas:—one set prevailing in the Virgin or Great Forests (*Caa-guaçu* of the Brazilians, *Monte Alto* of the Venezuelans) which clothe the fertile lands beyond the reach of inundations, and constitute the great mass of the vegetation; another in the Low or White Forests (*Caa-tinga*, *Monte Bajo*)—those curious remnants of a still more ancient and humbler but surpassingly interesting vegetation, which (especially on the Rio Negro and Casiquiari) are being gradually hemmed in and supplanted by the sturdier growth of the Great Forests, wherein they are interspersed like flower-beds in a shrubbery; another in the Riparial Forests (*Ygapú* or *Gapó*, *Rebalsa*), on lowlands bordering the rivers, and laid under water for several months in the year, where the trees when young, and the bushes throughout their existence, must have the curious property of being able to survive complete and prolonged submersion, constituting for them a species of hybernation; a fourth in the Recent Forests (*Caa-puéra*, *Rastrojo*), which spring up to replace the Primitive Forests destroyed by man, and, notwithstanding their weedy character, consist chiefly of shrubs and trees; a fifth in the Savannas or Campos—grassy or scrubby knolls, or glades, or hollows (dried-up lakes), which bear a very small proportion indeed to the vast extent of woodland, in the Amazon valley proper, but towards its northern and southern borders compete with the woods for the possession of the ground, and in the centre of Venezuela enlarge to interminable grassy “llanos” or plains.

From an elevated site that should embrace the landscape on all sides to the extreme limit of vision, as, for instance, from the heights at the confluence of the Rio Negro and Amazon, or, better still, from one of the steep granite rocks that overlook the noble forests of the Casiquiari, a practised eye would distinguish the various kinds of forest by their aspect alone. The Virgin Forests are distinct enough by the sombre foliage of the densely-packed, lofty trees, out of which stand, like the cupolas, spires, and turrets of a large city, the dome-shaped or pyramidal or flat-topped crowns of still loftier trees, overtopping even the tallest palms, both palms and trees being more or less interwoven with stout gaily-flowering lianas; the White Forests by the low neat-growing and

thinly-set trees and bushes, with scarcely any lianas—the palms few, but peculiar, and often odd-looking,—on a near view by the greater abundance of Ferns, especially on the trees, and sometimes of terrestrial Aroids and Cyclanths; the Recent Forests by their low irregular tangled growth, paler foliage, and general weedy aspect; the Riparial Forests, even where the water is not visible, by the varied tints of the foliage, and by the trees rarely equalling those of the Virgin Forest in height—sometimes, indeed, beginning on the water's edge as low bushes, thence gradually growing higher as they advance inland, until at the limit of inundations they mingle with the primeval woods, and are almost equally lofty,—by the greater proportion of herbaceous lianas which drape the trees and often form a curtain-like frontage,—and by the abundance of Palms, whereof the taller kinds usually surpass the exogenous trees in height, and (the Fan-Palms especially) often stretch in long avenue-like lines along, or parallel to, the shore. On some black-water rivers, such as the Pacimoni, the Atabapo, and the Rio Negro in some parts of its course, the breadth of inundated land is entirely clad with bushes and arbuscules of very equable height, on the skirts of which the Virgin Forest rises abruptly to a height more than twice as great. This is called by the natives “Caatinga-gapó.”

Besides these differences of aspect, the natives will tell you there are other more intrinsic ones,—for instance, that the riparial trees have softer and more perishable timber, as well as inferior fruits; while the Caatingas, with a far greater show of blossom, have hardly any edible fruit at all, and very few indeed of the trees rise to the magnitude of timber-trees. And yet, when the constituent plants of the different classes of forest come to be compared together, they are found to correspond to a degree quite unexpected; for, although the species are almost entirely diverse, the differences are rarely more than specific. It is only in the Caatingas that a few genera, each including several species, seem to have taken up their exclusive abode: such are *Commianthus* among Rubiaceæ, *Pagamea* among Loganiaceæ, *Myrmidone* and *Majeta* among Melastomaceæ; and there are a few other peculiar genera, chiefly monotypic. But, of the riparial plants, nearly every species has its congener on *terra firma*, to which it stands so near, that, although the two must of right bear different names, the differences of structure are precisely such as might have been brought about by long exposure even to the existing state of things, without supposing them to date from widely different con-

ditions in the remote past; and this is especially true of such genera as *Inga*, *Pithecolobium*, *Lecythis*, and of many Myrtles and Melastomes, Sapotads, &c.

As an illustration of the features which tend to impress a certain character of uniformity on the vegetation of the Amazon region, I will take the case of a single tree, *Bertholletia excelsa* (H. & B.)—perhaps the noblest tree of the Amazon region, and the most characteristic of its Virgin Forests—and briefly sketch its distribution. In aspect and foliage it is not unlike a gigantic Chestnut-tree; and the seeds (the Pará nuts of commerce), if not much like chestnuts in their trigonous bony shell, are not very different in taste, whence the Brazilian name of the tree (*Castanheira*), and of the seeds (*castanhas*). This tree is found almost throughout the Amazon valley, both to north and south, chiefly wherever there is a great depth of that red loam which it pleases M. Agassiz to call “glacial drift.” About Pará itself there is no lack of it, especially in the fine woods of Tauaú; and 1200 miles further to the west it may be seen in some abundance on the very banks of the Amazon, between Coary and Ega, at a part called Mutúncoára (Curassow’s Nest), where steep red earth-cliffs border the river and forest; while it extends many hundred miles up the Purús and other southern affluents. North of the main river I have seen it at many points—for instance, in the forests of the Trombetas and at the falls of the Aripecurú, in various places along the Rio Negro, where one village (Castanheiro) takes its name from it, and on the Casiquiari and Upper Orinoco, where it was first seen and described by Humboldt and Bonpland.

A magnificent palm, *Maximiliana regia* (Mart.)—Inajá of the Amazon, Cocurito of the Orinoco—frequently accompanies the *Bertholletia*, and is still more widely and generally dispersed. I have seen it as far to the south as in 7° lat.; and in $5\frac{1}{2}^{\circ}$ N. lat., at the cataracts of the Orinoco, it is still as abundant as on the Amazon. It even climbs high on the granite hills. On one which I ascended near the falls of the Rio Negro, an Inajá palm occupied the very apex, at 1500 feet above the river; and with the telescope I have distinctly recognized this palm at a much greater elevation on Duida and other mountains. Both the tree and the palm range to northward and southward beyond the limits of my own explorations; and there are a few other arborescent plants which stretch all through South America, from the base of the coast-range of Caracas (or even in a few cases from the West-India Islands) to the region of the river Plate; but these are chiefly

trees such as sprinkle the savannas, or are gathered into groves, along both the northern and southern borders of the great Amazonian forest-belt, wherein they now barely exist on the bits of "campos" that at wide intervals break the monotony of the woodland—although they probably at some antecedent period ranged continuously from north to south.

In other cases, closely allied species occupy distinct areas. One of the finest fruits of Equatorial America, the Cocura (*Pourouma* of Aublet), is borne in large grape-like bunches on trees of the Breadfruit tribe, having large palmatifid hoary leaves, quite like those of their near allies the Cecropias. Now the Cocura of the mid-region of the Rio Negro, of the Japurá, and of the Upper Amazon or Solimões, is one species (*Pourouma cecropiæfolia*, Mart.), while that of the mouth of the Rio Negro and adjacent parts of the Amazon is a very distinct and smaller-fruited species (*P. retusa*, Spruce), and that of the Uaupés is a third species (*P. apiculata*, Spruce), all three being so plainly diverse that the Indians distinguish them by adjective names, although that diversity or divergence, as in a vast many parallel instances, is but a measure of the time that has elapsed since their derivation from a single stirp.

But the most general cause of resemblance lies in this fact, that there are many orders and families of plants whereof many of the species are confined to limited areas, and yet, throughout the Amazon valley, each order, or family, will be everywhere represented by about the same number of individuals and species, having to each other nearly the same correlation, as regards aspect and sensible properties—provided always that the conditions of growth (as above defined) be the same; so that a plant which serves as food for any particular animal or tribe of animals in a given locality, is pretty certain to have its congener (or at least its coordinate) in any other locality of the same region.

The Riparial Plants of the Amazon (such, namely, as grow between ebb- and flood-mark, or within the limits to which the annual inundations extend) range in many instances from the very mouth of the river up to the roots of the Andes; and I do not yet know of a single tree which is not found both on the northern or Guayana shore and on the southern or Brazilian*. The most notable example of this extensive range is the Pao Mulatto, or Mulatto Tree (*Enkylista*, Benth.), a tall elegant tree allied to the Chinchonas, and conspicuous from its deciduous brown bark,

* Hence I suspect that those insects of the south side of the Amazon which have been identified with Guayana species, belong chiefly to the Riparial forests.

which grows everywhere on lands flooded by the Amazon, and, from its accessibility and the readiness with which its wood burns while green, supplies a great part of the fuel consumed by the steamers that navigate the Amazon. It is almost equally common on some of the white-water tributaries; I have seen it, for instance, far away up the Huallaga to the south, and up the Pastaza to the north. Two of the commonest river-side Ingas of the Amazon (*I. splendens*, W., and *I. corymbifera*, Benth.) reappear together on the Upper Casiquiari and Orinoco; and similar instances might be multiplied indefinitely.

Streams of black or clear water have also their proper riparial vegetation, some species being apparently repeated on all of them. For example, many of the trees of the inundated margins of the Tapajoz (some of them undescribed when I first gathered them) I found afterwards on the Rio Negro up to its very sources—although none of them inhabit the shores of the Amazon, either between the mouths of those two affluents or elsewhere. A few recur on the Teffé and other black-water streams entering still further to the west, and even on similar affluents of the Orinoco.

Here, at least, would seem to be a case of the vegetation depending on the distribution of the running waters; but in reality both the kind of water and the vegetation nourished by it depend entirely on the nature of the soil, those rivers which run chiefly through soft alluvial bottoms being turbid, while those that have a hard rocky bed run clear; and the two classes of rivers are repeated over and over throughout the length and breadth of the Amazon region. Into the black Rio Negro runs that whitest of rivers, the Rio Branco, and imparts to the vegetation of the former, for a little way below their confluence, quite an Amazonian character*. The two largest tributaries of the Casiquiari, namely the Pacimoni and the Siapa, run nearly parallel through a longish course, and at rarely more than fifteen miles apart; yet the former has clear dark water, and the latter is excessively muddy. Moreover, when I explored the Pacimoni to its very sources, I found it divide at last into two nearly equal rivulets, whereof the one had white and the other black water. The true riparial vegetation in all these, and in hundreds of other cases, is invariably modified after the same fashion by the colour of the waters. How it became what it is, and how it came there at all, are questions not to be discussed here.

* Here, for instance, is the only locality throughout the Rio Negro for *Bombax Munguba*, a fine silk-cotton tree abounding on the Amazon.

After what has been said, it is scarcely necessary to add that many species of plants which grow down to the very coast in Guayana exist also in the Peruvian province of Maynas—that is, at the eastern foot of the Andes, and even up to a height of a few thousand feet in those mountains,—*e. g.* Humboldt's Willow (*Salix humboldtiana*, W.) and the Cannon-ball Tree (*Couroupita guianensis*, Aubl.), called *Aia-uma*, or Dead Man's Head, in Maynas; while the proportion of Orinoco plants repeated on the Amazon is much greater than that of the plants of South Brazil. Nor does this uniformity of character, and the constant recurrence of certain species, preclude the possibility of the flora being wonderfully rich; for I have calculated that by moving away a degree of either latitude or longitude, I found about half the species different; while in the numerous "caatingas" I have explored I always found a few species in each that I never saw again, even in other "caatingas".

The importance of inquiries of this class is obvious, even from a zoological point of view; for that an animal should flourish in any region it must there find suitable food; and there is perhaps no part of the world where so large a proportion of the animals is so directly vegetarian in its diet. I have reason to believe that there is no carnivorous animal on the Amazon and Orinoco which does not occasionally resort to vegetables, and especially to fruits, for food,—not always of necessity, but often from choice. When, however, we come to consider and compare the distribution of the various classes and subordinate groups of animals, we see that the range of a fruit-eating species or tribe can rarely correspond to that of one which feeds on leaves—and similarly of other pairs of differences or contrasts in the nature of the food,—that, in short, the only animals which can be expected to range from sea to sea in a wide continent are a few general feeders and their parasites, the larger beasts of prey, and the scavengers, such as Vultures among birds (and perhaps Termites among insects).

As to the distribution of the Lepidoptera in the Amazon valley, it is plain that it can rarely correspond to the grander features of the vegetation, for the simple reason that the food of caterpillars is scarcely ever the foliage &c. of the loftier forest-trees, but chiefly of soft-leaved undershrubs and low trees (1) which grow under the shade of the forest and have, many of them, a restricted range, or (2) which spring up where the primeval woods have been destroyed, and in waste places near the habitations of men, and whose range in many cases is coextensive at least with Cisandine Tropical

America. The bushy trees and the luxuriant herbs which border savannas and "caatingas" and broad forest-paths, and sometimes those which grow on the very edge of streams, are also apt to be infested by caterpillars. Of about two thousand forest-trees I have had cut down in the Amazon region for the sake of their flowers and fruits, very few indeed have been infested by caterpillars. A tall Leguminosæ (tree or liana) or Bombaceous species would sometimes have caterpillars on it; more rarely a Laurel or a Nutmeg; but a Fig or a Guttifer never. A vast number of trees and lianas of all sizes are, indeed, excluded from serving as food to caterpillars by their strongly resinous or else acrid and poisonous juices,—and many more on account of their hard leathery leaves, which are untouched except, rarely, by minute caterpillars that eat themselves galleries in the parenchyma.

Of plants which afford food for caterpillars, Leguminosæ hold decidedly the first place; next to these rank Mallow-like plants (including Malvaceæ proper, Sterculiaceæ, Büttneriaceæ, and Tiliaceæ); then Melastomaceæ and Solanaceæ. Caterpillars armed with stinging hairs seem peculiarly partial to Leguminosæ, as I know to my cost, the bushy Inga trees in some parts being scarcely approachable when with flowers and young leaves. In the neighbourhood of Guayaquil, children that stray under the Tamarind-trees sometimes get severely stung by the hairy caterpillars that drop on them from the trees.

Other orders of plants on which I have encountered caterpillars are chiefly the following. Among ENDOGENS: Grasses, Sedges, Palms, and Aroids—on all rather rarely; on Scitamineæ and Musaceæ more frequently. Among EXOGENS: Euphorbiaceæ (principally on those with aromatic foliage); Samydeæ; Bixaceæ; Vochysiaceæ; Sapindaceæ (few); Malpighiaceæ; Anonaceæ and Myristiceæ (rarely); Anacardiaceæ; Ochnaceæ (on very young leaves only, the adult foliage being hard and vitreous); Podostemeæ; Polygoneæ; Amarantaceæ; Piperaceæ; Lauraceæ (few); Chrysobalanæ (often much infested); Combretaceæ; Myrtaceæ (rarely on true Myrtles, but a great pest to the large handsome flowers of the suborders Barringtoniæ and Lecythideæ); Passifloreæ; Cucurbitaceæ; Rubiaceæ (few out of the vast number of Amazon species); Compositæ (all weeds); Boragineæ; Verbenaceæ; Bignoniaceæ. Besides these, there are other orders, which contain a few species with mild juices, and leaves (and even wood) not too tough for a caterpillar's jaws, which are doubtless chosen by certain species of butterflies as food for their pro-

geny ; and nearly all the very large flowers are apt to be plagued by caterpillars, as well as by the grubs of flies and beetles*.

Some caterpillars seem to have a decided taste for bitters ; and narcotics are rarely objected to ; indeed I should say that most insects are decidedly partial to them, while bees and wasps seem to have a positive pleasure in getting drunk. The very few phyllophagous beetles whose habits have come under my notice feed on narcotic plants. At the falls of the Rio Negro, just south of the equator, a common weed in the village of São Gabriel is *Solanum jamaicense*, Sw., growing (when not disturbed) to the size of a currant-bush, and bearing large angular soft woolly leaves. In February 1852, there appeared swarms of a large black beetle, whose corpulent abdomen was barely half-covered by the elytra (whence I suppose it an ally of our Meloës), and whose sole food was this *Solanum*. Their feeding-times were the dusk of evening and morning, when they would arise, as it were, out of the earth, hover over the plants like a swarm of bees, and then settle down in such numbers that the plants were black with them. From one of the *Solanum*-plants I began to fill a bottle with beetles ; but although I scared away twice as many as I captured, at the end of ten minutes nothing was left of the leaves but the midribs. A few beetles lingered on the *Solanum* all through the hot day, scarcely feeding at all, and apparently narcotized. I believe our own Oil-beetle eats the narcotic foliage of buttercups, but I know not if it ever goes the length of getting tipsy on it.

Before entering on the main object of this paper, which is to record the facts of certain migrations that have fallen under my notice—rather as problems to be solved by abler naturalists than myself, than with the pretension to offer any complete solution of my own—I may digress so far as to say that when I reached the Amazon in 1849, I considered myself fortunate in finding the zoological portion of the field already occupied by two such able naturalists as Messrs. Bates and Wallace, thus leaving me free to bestow my undivided attention on the botany. There are indisputable advantages in the concentration of one person's energies on a single kingdom of Nature ; but in the consideration of many important general problems the disadvantages of this circumscribed range of observation are manifest. I could not, for instance, devote

* The above list has no further value than that of indicating, so far as my notes and recollections serve me, the kinds of plants which I have seen most maltreated by caterpillars in the Amazon region.

any time or take any pains to ascertain the perfect insect of the larvæ which fed on my plants; nor can the zoologist keep a specimen of every plant which an animal feeds upon. When a zoologist, a botanist, and a geologist, each having had the requisite previous training, shall combine to explore anew the Amazon valley, they will be able to connect many facts which now unavoidably remain isolated, and to deduce therefrom many interesting particulars of the course and actual distribution of organized beings therein. For myself, I am free to confess that I too generally looked on the insect world as enemies to be avoided or destroyed. Mosquitos and ticks sucked my blood; cockroaches ate and defiled my provisions; caterpillars mutilated the plants when growing; and ants made their nests among the dried specimens and saturated them with formic acid, or even cut them up and carried them away bodily. I recollect my horror at coming home and finding my house invaded by an army of "Arriero" or "Sauba" ants, who had fallen on a pile of dried specimens, and were cutting them up most scientifically into circular disks whose radius was just equal to the artist's own longest diameter. The few notes on insects scattered through my journals relate, indeed, chiefly to ants—who deserve to be considered the actual owners of the Amazon valley, far more than either the red or the white man. In fine, when I venture to offer these imperfect jottings to the notice of zoologists, I feel that I can at best be considered only an interloper in a province not my own.

Having above indicated the kinds of plants apparently most in request with the larvæ of the Lepidoptera, I wish now to recall the attention of naturalists to certain transits or migrations of the adult insects across the Amazon, which have already been described by Messrs. Edwards, Wallace, and Bates, and perhaps by other travellers. The first time I fell in with such a migration was in November 1849, near the mouth of the Xingú, when I was travelling up the Amazon from Pará to Santarem; and it is thus sketched in my Journal:—

"The wind dropping in the afternoon, we accompanied a party of sailors from the brig, in a canoe, to what was now a muddy island, but in the rainy season had been a shoal some fathoms under water—we in quest of plants, and they of eggs of ducks and "tuyuyús"; but after stumping about for above an hour in the hot mud, which parboiled our legs and feet, we reembarked, having found no plants except a *Pontederia* and a *Cyperus*, and the

sailors no eggs at all. As we returned to the brig we saw a vast multitude of Butterflies flying across the Amazon, from the northern to the southern side, in a direction about from N.N.W. to S.S.E. They were evidently in the last stage of fatigue: some of them attained the shore; but a large proportion fell exhausted into the water, and we caught several in our hands as they passed over the canoe. They were all of common white and orange-yellow species, such as are bred in cultivated and waste grounds, and, having found no matrix whereon to deposit their eggs to the northward of the river (the leaves proper for their purpose having probably been already destroyed, or at least occupied, by caterpillars), were going in quest of it elsewhere.”

The very little wind there was blew from between E. and N.E.; therefore *the butterflies steered their course at right angles to it*; and this was the case in subsequent flights I saw across the Amazon, although when the wind was strong the weaker-winged insects made considerable leeway, and would doubtless most of them succumb before reaching land. But the most notable circumstance is that *the movement is always southward*, like the human waves which from the earliest times seem to have surged one after the other over the whole length of America, generating after a time a reflux northwards, as in the case of the empire of the Incas. Is this tendency southwards the continuation of an impulse given in the remote past by the influx at the north-eastern and north-western corners of America of races of insects as well as of men to people the vast continent, or to dispute its possession with beings already existing there? For, allowing their due weight to such motives as hunger and desire, they seem insufficient to explain a movement invariably directed towards the same point of the compass; and if, as I suppose, butterflies steer their flight at right angles to the wind, because they thus make most headway, why do they not sometimes cross from south to north, which would be quite as advantageous with an easterly wind, unless they inherit some instinct which constantly impels them southward?

Since my return to England I have read Mr. Bates's graphic description of a flight of butterflies across the Amazon below Obidos, lasting for two days without intermission during daylight. These also all crossed in one direction, from north to south. Nearly all were species of *Callidryas*, the males of which genus are wont to resort to beaches, while the females hover on the borders of the forest and deposit their eggs on low-growing, shade-loving *Mimosæ*. He adds, “The migrating hordes, so far as I

could ascertain, are composed only of males”*. It is possible, therefore, that in the flights witnessed by myself the individuals were all males—in which case the flights should probably be looked upon, not as migrations, but dispersions, analogous to those of male ants and bees when their occupation is done, and they are doomed by the workers to banishment, which means death. In the case I am about to describe, however, the swarms certainly comprised both sexes, although I know not in what proportion; and their movements were more evidently dependent on the failure of their food.

In the year 1862 I spent some months at Chanduy, a small village on the desert coast of the Pacific northward of Guayaquil, where one or two smart showers are usually all the rain that falls in a year: but *that* was an exceptional year, such as there had not been for seventeen years before—with heavy rains all through the month of March, which brought out a vigorous herbaceous vegetation where almost unbroken sterility had previously prevailed. In April, swarms of butterflies and moths appeared, coming from the east, sucking the sweets of the newly opened flowers, and depositing their eggs on the leaves, especially of a *Boerhaavia* and of a curious Amaranth (*Frœlichia*, sp. n.) not unlike our common Ribgrass in external aspect—until caterpillars swarmed on every plant. New legions continued to pour in from the east, and, finding the field already occupied, launched boldly out over the Pacific Ocean, as Magalhaens had done before them, there to find a fate not unlike that of the adventurous navigator†. No better luck attended most of the offspring of their predecessors, especially those who fed on the *Boerhaavia*, which was much less abundant than the *Frœlichia*. The shoal of caterpillars advanced continually westward, eating up whatever to them was eatable, until, on nearing the sea-shore and the limit of vegetation, I used to see them writhing over the burning sand in convulsive haste to reach the food and shelter of some *Boerhaavia* which had haply escaped the jaws of preceding emigrants; but, failing this, thousands of them were scorched to death, or fell a prey to the smaller sea-side birds, to whom they were doubtless a rare dainty.

The explanation of this continual westward movement is not difficult. A few leagues inland, instead of the sandy coast-desert with here and there a tree, we find woods, not very dense or lofty, but where there is sufficient moisture to keep alive a few rem-

* ‘Naturalist on the Amazons,’ vol. i. p. 249

† Here also the course attempted to be steered by the insects was across the strong southerly breeze that was blowing.

nants of the above-mentioned herbs all the year round, and doubtless also of the insects that feed upon them. There are also cattle-farms; and around the wells from which water is drawn and served to the cattle, the same weeds are continually springing up; while the seeds, even of those that grew on the desert, remain imbedded in the sand and retain their vitality during all the years of drought. When the rains come on, therefore, they cause, as it were, a unilateral development of the vegetation from the forest across the open grounds, and a corresponding expansion of the insect-life which breeds and feeds upon it.

Results the same in principle, but diverse in mode, would take place under different local circumstances. Thus, if we suppose an oasis in the midst of a desert exposed to the same exceptional access of moisture as the desert of Chanduy with its forest skirt, there would be generated an extension of organic life radiating outwards in all directions.

Besides the migrations above recorded, I have many times in South America seen butterflies flying across rivers so wide that it is impossible to suppose they could be guided by any indication of sight or smell. Animals of higher organization and stronger reasoning-powers would probably turn aside along the shore of the river or ocean in quest of food for themselves and their offspring; but there are plainly cases where frail little creatures, such as butterflies, must go straight forward at a venture, and either attain their object or perish.

The movements of Ants registered in my journal are (as may be supposed) chiefly such as were hostile to myself, and they do not throw much additional light on their habits. "Ecitons," or Foraging Ants (called *Cazadoras* in Peru), seem to be true wandering hordes, without a settled habitation; for a certain number of them may always be seen carrying pupæ, apparently of their own species; but they sojourn sometimes for several days whenever they come upon suitable food and lodging. I have sometimes thought that the name "Tauoca" or "Taboca," applied to these ants on the Amazon, and also to bamboos of every kind, might indicate that they really made their nest in the cavities of bamboos; but I have been unable to verify it, although the name "Tachí" or "Tacyba" is certainly given to certain trees (*Tachia guianensis*, Aubl., *Triplaris surinamensis*, Camb., &c.) and also to a very wicked set of ants that inhabit the hollow branches of those trees. Hundreds of times I have come upon marching columns of "Ecitons" in the forest, and have sometimes paid dearly for my heedlessness in

stepping on them. Once at midnight, in the depth of the forest, I got entangled with an army of them on its march ; which seems to show that they are on foot at all hours*.

The first time I saw a house invaded by *Cazadoras* was in November 1855, on the forest-slope of Mount Campana, in the eastern Peruvian Andes. I had taken up my abode in a solitary Indian hut, at a height of 3000 feet, for the sake of devoting a month to the exploration of that interesting mountain. The walls of the hut were merely a single row of strips of palm-trees, with spaces between them wide enough to admit larger animals than ants. One morning soon after sunrise the hut was suddenly filled with large blackish ants, which ran nimbly about and tried their teeth on everything. My *charqui* proved too tough for them ; but they made short work of a bunch of ripe plantain, and rooted out cockroaches, spiders, and other suchlike denizens of a forest hut. So long as they were left unmolested, they avoided the human inhabitants ; but when I attempted to brush them away they fell on me by hundreds, and bit and stung fiercely. I asked the Indian's wife if we had not better turn out awhile and leave them to their diversions. "Do they annoy you?" said she. "Why you see it is impossible for one to work with the ants running over everything," replied I. Whereupon she filled a calabash with cold water, and going to the corner of the hut where the ants still continued to stream in, she devoutly crossed herself, muttered some invocation or exorcism, and sprinkled the water gently over them. Then walking quietly round and round the hut, she continued her aspersion on the marauders, and thereby literally so damped their ardour that they began to beat a retreat, and in ten minutes not an ant was to be seen.

Some years afterwards I was residing in a farmhouse on the River Daule, near Guayaquil, when I witnessed a similar invasion. The house was large, of two stories, and built chiefly of bamboo-cane—the walls being merely an outer and an inner layer of cane, without plaster inside or out, so that they harboured vast numbers of cockroaches, scorpions, rats, mice, bats, and even snakes, although the latter abode chiefly in the roof. Notwithstanding the size of the house, every room was speedily filled with the ants. The good lady hastened to fasten up her fresh meat, fish, sugar, &c. in safes inaccessible even to the ants ; and I was prompt to impart my experience of the efficacy of baptism by water in ridding a house of such pests. "Oh!" said she laughingly, "we

* See Mr. Bates's full and lucid account of these insects, *I. c.* p. 350.

know all that; but let them first have time to clear the house of vermin; for if even a rat or asnake be caught napping, they will soon pick his bones." They had been in the house but a very little while when we heard a great commotion inside the walls, chiefly of mice careering madly about and uttering terrified squeals; and the ants were allowed to remain thus, and hunt over the house at will, for three days and nights, when, having exhausted their legitimate game, they began to be troublesome in the kitchen and on the dinner-table. "Now," said Doña Juanita, "is the time for the water cure;" and she set her maids to sprinkle water over the visitors, who at once took the hint, gathered up their scattered squadrons, reformed in column, and resumed their march. Whenever their inquisitions became troublesome to myself during the three days, I took the liberty to scatter a few suggestive drops among them, and it always sufficed to make them turn aside; but any attempt at a forcible ejection they were sure to resent with tooth and tail; and their bite and sting were rather formidable, for they were large and lusty ants. For weeks afterwards the squeaking of a mouse and the whirring of a cockroach were sounds unheard in that house*.

The most remarkable migration that I have myself witnessed in South America is that of the great Wood-Ibis (*Tantalus loculator*), called "Jabirú" in Brazil, "Gauán" in Venezuela, between the Amazon and the Orinoco, a distance of from 300 to 500 miles in a straight line, but a thousand or more following the course of the rivers. The migrations are so timed that the birds are always on the one river or the other when the water is lowest and there is most sandy beach exposed, affording the greatest extent of fishing-ground. In the years 1853 and 1854, when I was at San Carlos del Rio Negro (lat. $1^{\circ} 53\frac{1}{2}'$ S.) I saw them going northward in November and returning southward in May, and had the pleasure of having some of them stay to dine with me. One of their halting-places on their way to the Orinoco was on islands near the mouth of the Casiquiari, at only a few hours' journey above San Carlos. There I have seen them roosting on the tree-tops in such long close lines, that by moonlight the trees seemed clad with white flowers. They descend to sandy spits of islands to fish in the

* The ants called "Carniceras," or Butchers, in Maynas, are probably of a tribe distinct from the Foragers; for they are burrowing ants, and are said to prefer the flesh of human carcases to any other food. Padre Velasco, in his 'History of Quito,' assures us that they will make a perfect skeleton of a corpse the very day it is buried, and that they devour any disabled animal, however large, they find in the forest.

grey of the evening and morning, *i. e.* before betaking themselves to their eyry, and before resuming their journey on the following day. The scarcity of fish in rivers of clear or black water is well known; and even were they more abundant, this very clearness of the water would render it difficult for fish-eating fowls to catch them, unless when there was little light; hence, perhaps, the Ibis's choice of hours for fishing; and the turbid water poured into the Rio Negro by the Casiquiari dulls its transparency at that point, which makes it eligible for a fishing-station, leaving probably only a single day's stage for the travellers to reach the Orinoco. The Ibises, however, did not, as one might have supposed, turn up the Casiquiari, but held right on to the north, crossing the isthmus of Pimichin, and descending the Atabapo to the Orinoco. Some of them, I was told, would halt on the Guaviare, whose turbid waters, alligators, turtles, &c. quite assimilate it to the Solimões or Upper Amazon; and others push on to the Apuré; the former lot, however, are said to travel chiefly by way of the Japurá from the Amazon. Those that frequent the Upper Orinoco return in May; and their halting-place near San Carlos is not at the mouth of the Casiquiari, but on islands a day's journey below the village, so that they are at that season less persecuted by the Indians. If they went all the way down the Rio Negro in May, they would reach the Amazon long before its beaches began to be exposed; but it has been ascertained that they sojourn awhile on the Rio Branco, whose beaches are earlier uncovered. Flocks of Wild Ducks sometimes accompany the Ibises; and it is quite possible that some of the smaller aquatic and riparial fowls make similar migrations.

When the Ibises are roosting, a shot or two from a gun is enough to make the whole caravan take to flight and remove to some distance; but the Indians of San Carlos know better than to scare them away with fire-arms. They get into their canoes a little after midnight, creep silently up the river, and under cover of the night disembark beneath the trees where the Ibises are roosting. Then, when at break of day the birds wake up, and begin to stir and to be visible, the Indians pick them off with poisoned darts from their blowing-canes, in great numbers, before the bulk of the flock takes alarm; so that they mostly return to the village with great piles of dead Ibises; and although this lasts only three or four days, the quantity killed is so great that, what with fresh and what with barbaqued game, everybody feasts royally for a fortnight; whereas throughout the rest of the year, the

dearth of provisions exceeds what I have experienced elsewhere in South America.

The Ibises doubtless undertake these voyages from the testimony and under the guidance of the elders, far more than from any inherited knowledge, or instinct; whereas the flights of butterflies one would think must be directed by instinct alone, without any aid from experience.

Many mammals wander far in search of food; and some that go in bands, such as wild Pigs and some Monkeys, have known feeding-places at certain times of the year, when some particular kind of fruit is in season there; so that the experienced Indian hunter often knows in what direction to bend his steps to fall in with a certain class of game. It is well known how fond all animals are of the Alligator-pear, which is the fruit of a large Laurel (*Persea gratissima*). I have seen cats prefer it to every other kind of food; and the wild cat-like animals are said to be all passionately fond of it. I have been told by an Indian that in the forests between the Uaupés and the Japurá, he once came on four Jaguars under a wild Alligator-pear-tree, gnawing the fallen fruits and snarling over them as so many cats might do. I have gathered flowers of at least four species of *Persea*, but was never fortunate enough to find one of them with ripe fruit; so that I have missed seeing the concourse of animals of many kinds which I am assured assemble in and under those trees, attracted by the fruit. While speaking of fruit-eating carnivora, it is worth mentioning that Dogs in South America often take naturally to eating fruit. I had in Peru a fine Spanish spaniel who, so long as he could get raw ripe plantains, asked for no better food. He would hold them between his paws, and pull off the skin in strips with his teeth so delicately as not to foul them in the least; so that I have occasionally eaten a plantain of his peeling.

I fancy Monkeys sometimes go on day after day along the banks of a river, their rate of progress depending on the quantity of food they find to eat and waste. I have watched them at this in a strip of Mauritia palms, which stretched for a distance of some days' journey along the banks of a river. The Chorro (Barrigudo of Brazil), a monkey of the hot plain, sometimes ascends the slopes of the Andes to five or six thousand feet, apparently to eat the fruit of the Tocte or Quitenian walnut (an undescribed species of *Juglans*), which is frequent at that elevation; but it is said never to pass a night there.

An Indian will tell you at what time of year certain fruit-eating

fowls are to be met with on the banks of a river, and at what time they must be sought for deep in the forest. I remember coming on a flock of one of the small Turkeys called Cuyubi (*Penelope cristata*, or an allied species), on the banks of the Uaupés, feeding on the fruit of so deadly a plant as a *Strychnos* (*S. rondeletiioides*, Benth. in Pl. Spr.); but the succulent envelope of the fruit is innocuous, like that of our poisonous Yew. I had been forwarned that we might expect to find them at that particular spot, and thus occupied; so that we had our guns ready, and knocked several of them over. Indeed they were so tame, or so gluttonous, that when a shot was fired and one of them fell, the rest either took no heed or only hopped on to another branch and recommenced feeding; and it was not until we had fired and reloaded three or four times that the survivors took wing and flew off.

On the slopes of the volcano Tunguragua, the steepest and most symmetrical cone, though not the loftiest, of the Quitenian Andes, I have seen flocks of another Turkey (allied to, but distinct from, the Uru-mutún of Brazil) feeding on the plum-like drupes of the Motilon*, and on the berries of an undescribed Melastome. Besides these fruit-trees, there were also numerous fruit-bearing bushes near, including some true Brambles, Whortle-berries, and a Hawthorn, all of which probably afforded food to the turkeys. This species seems to inhabit a zone, between 6000 and 10,000 feet, on the wooded flanks of Tunguragua, and within those limits to make the perpetual round of the mountain, being always found on that side where there is most ripe fruit to be had; and the birds are so tame and sluggish when feeding that the Indians easily kill them with sticks.

I should suppose that these and other gallinaceous birds have their fixed centres of resort (breeding- and roosting-places) from which they never stray far. Many Parrots and Macaws, I know, have. On the western slopes of the Quitenian Andes, immense flocks of Parrots ascend by day to a height of 8000 or 9000 feet, where they ravage the fields of maize and other grain, but always descend to certain warm wooded valleys, at 2000 to 4000 feet, to roost. The flights of vast multitudes of garrulous parrots and macaws to and fro between their roosting- and feeding-places, in the grey of the evening and morning, is one of the first things that strike the attention of the voyager on the Amazon.

The periodical appearance of certain birds in a district has been

* This name is given to *Symplocos cernua*, H. B. K., and also to two (or more) species of *Hieronyma*, all bearing edible drupes.

supposed by the inhabitants to have some mysterious connexion with the Christian festivals. Thus there are two beautiful little birds in Maynas, apparently belonging to different genera, for one of them is a Seven-coloured Tanager (*Pajaro de siete colores*), and the other (which I have not seen) is said to be of a bright blue colour and differently shaped; but both are called by the Indians *Huata-pisco* (Bird of the Year), because they make their appearance together, in large flocks, about the end of the year (people will tell you, precisely on Christmas-day), and remain throughout January, when they are seen no more until the same epoch comes round again. Mr. Bates has given a capital account of the movements of these hunting-parties of frugivorous and insectivorous birds, and of the superstition of the *Papa-uirá* or Patriarch Bird, who is supposed to head them (vol. ii. p. 333 *et seq.*). I suspect that this is something more than mere superstition, and that the Patriarch leaders are not one but several to each predatory band.

The abundance of fish in rivers of white water, and their scarcity in black-water rivers, may easily be shown to depend chiefly on the luxuriant littoral vegetation of the former and its scarcity or utter absence in the latter; for on the Rio Negro there are (with one notable exception*) no aquatics, and no shore grasses. Compare this with the broad fringe of tall succulent amphibious grasses on the shores of the Amazon, or detached and floating down it in the shape of large islands,—and of luxuriant aquatics, some fixed by roots, others floating (*Victoria*, *Jussiaea*, *Pontederia*, Frogbits, *Azolla*, *Salvinia*, *Pistia*, &c.), in deep still bays, but especially in lakes and channels communicating with the main river.

Some of the tributaries of the Rio Negro, however, have plenty of fish—namely, those of more or less turbid water, of which the Rio Branco holds the first rank, and after it come the Marauíá and Cauaborís, all entering on the left bank. In these rivers many Amazon fish are said to be repeated. About the mouth of the Rio Branco is the only place in the Rio Negro where the Pirarucú is found—that noble and remarkable fish, so characteristic of the Amazon. With the exception of the Pirarucú, most of the larger fish of the Amazon recur on the Upper Orinoco, above the cataracts; at least the Indians assert them to be the same, and to unskilled eyes they are undistinguishable. The Valenton, or Lablab, of the Orinoco (for instance) is surely the same as the large Pirahyba of the Amazon; the Pavon as the Tucunaré; the Ral-

* That of the *Podostemons* on granite rocks in the falls and rapids.

lado as the Surubím; the Murucútu as the Tambaquí; the Cajáru as the Pirá-arára, and so on. And if the Tambaquí of the Amazon have been correctly identified with *Cichla temensis*, then a large fish inhabiting the Temi, a small black-water tributary of the Orinoco, is the same one that abounds in the white water of the Amazon: but this needs confirmation; for white-water fish are known to shun black waters, and the Tambaquí is (so far as I know) absent from the Rio Negro proper, although it begins to be found a little way within the Casiquiari.

Supposing these fishes of the Amazon and Orinoco to be really identical, the question arises, Has there been and is there still any migration of fish between those rivers, by way of the Negro and the Casiquiari? or does their actual distribution date from the period when chains of lakes preceded the rivers to which the waters are now limited, and the colour and properties of the latter were more uniform throughout the whole region?

Many of the fishes of the Rio Negro travel up it to spawn, and especially up some of its tributaries; but the wanderings to and fro of fish in quest of food may be compared to that already noted of wild turkeys; for the principal subsistence of fish in the Rio Negro is on the fruits of riparial trees, some of which seem scarcely touched by either bird or monkey. A small laurel-like bush (*Caraipa laurifolia*, S.) lines the banks in many places, and bears damson-like drupes, which are the favourite food of that delicious fish the Uaracú or Aracú. When the ripe drupes are dropping into the water they attract shoals of Uaracú. Then the fisherman stations his canoe at dawn of day in the mouth of some still igarapé, overshadowed by bushes of Uaracú-Tamacoari (the native Indian name of the tree), and with his arrows picks off the fish as they rise to snatch the floating fruits. It ought to be mentioned that the fish of the Negro, if much fewer, are some of them perhaps superior in flavour to any Amazon fish, whereof the Uaracú is an example, and the large Pirahyba is another, the latter being so luscious that it is difficult to know when one has had enough of it, whereas the same or a very closely allied species of the Amazon is often scarcely edible*.

I have, in what precedes, purposely avoided speaking of the way in which animals prey on each other, because the ultimate measure of the amount of animal life must always depend on that of

* For further information on the fishes of the Rio Negro I must refer to Mr. Wallace's interesting account of that river ('Travels,' chs. 9, 10 & 16), and to Schomburgk's 'Fishes of Guiana.'

vegetable life, and not because I shut my eyes to the fact. In proof of this, take the following note from my Journal, under date May 15th, 1857, written on the Bobonasa, a tributary of the Pastasa, during my disastrous journey from Peru to Ecuador.

"This morning, coasting along a low shore, our men spied a small white Alligator sleeping in the sun, and killed him with their lances. His stomach was distended by some food he had taken, and on piercing it a snake's tail protruded. I laid hold of it and drew out the snake, which was tightly coiled up. It was still alive, though so much crushed below the head as to be unable to move away. It was a land species, not venomous, yellow, with black spots on the back, the body thick, passing abruptly into a short slender tail, the entire length just 3 feet, and its destroyer no more. Thus we go on preying on each other to the end of the chapter. This poor snake, while watching for frogs among the moist stones and roots, little dreamt he was about to serve for an alligator's meal, nor the alligator that he would soon be eaten up by Indians. The snake, however, died with an empty belly, while the alligator had gotten his breakfast, which was some consolation; for it is a very 'Let-us-eat-and-drink-for-tomorrow-we-die' sort of life that all God's creatures (man included) live in this wild region."

I leave these *disjecta membra* in the hands of naturalists, hoping that they may find among them some bone to pick. They bear on many problems for which there do not yet exist materials, nor do I possess the skill, requisite to arrive at a correct solution. On one point only I am pretty clear, viz. that almost every kind of animal now existing in Cisandine Tropical America might find suitable food and lodging on any parallel between the southern tropic and the mouth of the Orinoco; which is as much as to say that they would find everywhere, either the one plant they most delight to feed on, or others which might suit them almost or quite as well. The continual substitution of new forms encountered as we advance in any direction, does not, on a superficial view, show much correspondence between animals and plants—a fact which may be put otherwise, thus:—Suppose on a given area at the foot of the Andes every species of some class of animals to be distinct from those of the same class on an equal area at the mouth of the Amazon, it does not therefore follow that every plant is different on the two areas; we know, indeed, that such is not the case. Yet the modifications that have been and are still in progress among vegetable forms must have some correspondence with

those that take place in animals; for all the realms of Nature act and react on each other. The atmosphere and the earth (with its productions, animal and vegetable) are continually giving and taking; and as their actual relations to each other vary more widely at different points along the equatorial belt than elsewhere on the earth's surface, it is plain that what seems equilibrium is either oscillation or progress in some direction. If plants were the only organic existences, and there were no animals to aid in their reproduction, to feed upon them, to dispose of their dead carcasses, &c., the dominant forms would doubtless be quite different from what they are now. Darwin has shown by an admirable series of observations how necessary insect agency is to the fertilization of the flowers of many plants. Hence the organs of those insects and the parts of the flowers have been (and are being) continually modified, or moulded, the one on the other. I can conceive that if certain Orchids were henceforth entirely freed from the visits of insects, their flowers, notwithstanding the apparent permanence of inherited (though now useless) peculiarities, would immediately *tend* to revert to the symmetry which no doubt they possessed in the remote types. I have a good deal of evidence to show that in tropical countries many peculiarities of structure in the leaves and other parts of plants (prevailing through large suites of species and genera) have been brought about, and are still in part maintained, by the unremitting agency of insects, especially of Ants. These and many other matters require the fullest investigation before the precise relations of the changes, in animals and plants, that are taking place under our eyes can be properly understood and appreciated.

A Catalogue of Erycinidæ, a Family of Diurnal Lepidoptera.

By H. W. BATES, Esq., F.Z.S. &c., Assist. Sec. Roy. Geogr. Soc. (Communicated by GEORGE BUSK, Esq., Sec. L.S.)

[Read June 20, 1867.]

THE Family Erycinidæ has increased so greatly, both in genera and species, since the last time its members were passed in review (by Westwood, in Doubleday and Hewitson's 'Genera of Diurnal Lepidoptera,' in 1851), that a new catalogue of its contents is much required. It is my intention, in the present memoir, to endeavour to supply this want, and to suggest a plan of classification of the genera—a work which has not hitherto been at-

tempted. The number of described species at the present time is not fewer than 630. In 1819, when Godart treated of the group, as one genus, in the 'Encyclopédie Méthodique,' only 134 species were described; and in 1851, Professor Westwood could muster only 247, exclusive of a few species insufficiently characterized by the older authors, and the knowledge of which at present appears to be lost.

The Erycinidæ are well distinguished from all other Butterflies, with the exception of the genus *Libythea*, forming a separate group allied to the Erycinidæ, by the anterior pair of legs in the males being aborted, without tarsal joints, or trace of claws and spines, the same legs in the females being of normal structure. The other characters which have been employed to distinguish the group are far from being so constant. The palpi are variable in length and shape; and the differences scarcely suffice to distinguish even subordinate groups of the family. The neuration of the wings, too, in some of the genera is very similar to that of the Lycænidæ, and in others differs from the Nymphalidæ only in the absence of an upper discocellular nervule to the fore wings; but this is not quite a definite character, as some species possess this nervule. The metamorphoses are also variable, some genera resembling the Nymphalidæ in the chrysalis being suspended by the tail*, and others the Lycænidæ in being recumbent and girt with silken threads. Too little is known of the caterpillars to enable us to say whether they offer any peculiarity. All the species, in the adult state, are of smaller size and weaker structure than the average of the Nymphalidæ, and are distinguished by the tenuity and fragility of the wing-membranes.

The geographical distribution of the Erycinidæ is interesting. All, except 34 species, are found in Tropical America. The whole of the Old-World species, 30 in number, belong to one subdivision, which is not, however, peculiar to the eastern hemisphere, the New World possessing a few genera coming within the same group. One species only is found in Europe, the well-known English butterfly, *Nemeobius Lucina*. The species of extratropical North America, four in number (one found in the

* In a former paper I had employed the character afforded by the position of the chrysalis to divide the Erycinidæ into two subfamilies, *Stalactinæ* and *Erycininæ*; but I have since found amongst my papers a note of the transformations of *Emesis mandana*, an insect which I once bred from the caterpillar, and found that the chrysalis is suspended by the tail, as in *Stalactis*. Such a fact as this entirely destroys the systematic value of metamorphosis in this family.

south-eastern States, and three on the western side of the Sierra Nevada) belong to Tropical American genera, of a subfamily which is peculiar to the New World. The family appears to be most numerous and flourishing in the equatorial zone, diminishing in the number of its representatives as we approach either tropic; and, with very few exceptions, the species are confined to the shades of the great forest which covers the lower levels of nearly the whole of this vast region. I collected, myself, 370 species on the banks of the Amazons, or three-fifths of the total number of known species. The family is remarkable for the wonderful diversity of form and colouring which it presents; and the habits of the species are almost equally varied. Some are of very slow, lazy flight, whilst others are excessively rapid in their movements. It may be stated, however, as a universal rule, that their flight is short, never exhibiting the sustained motion which is characteristic of the Nymphalidæ, Satyridæ, and other superior families of butterflies. A large number of genera have the habit of settling on the underside of leaves near the ground, extending their wings flat on the leaf. In many genera, on the contrary, the position of the wings in repose is vertical; and a few species settle on the upper surface of leaves with the wings half elevated. As these differences are constant in several large genera, it might be thought that they offered a clue to a natural classification of the family—an object of difficult attainment, if we employ structural characters only; but there are too many exceptions to the rule to render it of any use for this purpose. Thus the Nymphidia and Lemoniades belong to those genera which extend their wings in repose, but *Lemonias*, *Belise*, and *Molela* hold them partially elevated, and *L. zygia* and allies quite vertical; similar exceptions occur in *Charis*, *Mesosemia* and others. Very few species frequent flowers.

I made a great number of dissections of Erycinidæ from fresh specimens whilst in South America, and prepared drawings of their wing-neuration, palpi, and legs, with a view to discovering sure indications of the natural relationships of the species and genera. Previously the species had been grouped chiefly from similarity of shape, colour, pattern, and general aspect; but something more definite was wanted, as the style of coloration changes abruptly in allied species in some genera, and very often the sexes are of totally different colours and patterns. After many abortive trials I have found the wing-neuration, notwithstanding the frequent anomalous exceptions which it presents, to afford the best characters for primary divisions.

Taking the number of branches to the fore-wing subcostal nervure as the groundwork, it is found that all the Old-World genera have four, and the great majority of the New-World genera only three. The few New-World genera in which there are four, grouped with those of the Old World, form our first subfamily, which I believe to be a perfectly natural one—that is, to comprise forms having a closer blood-relationship to each other than to the members of the other subfamilies. The only exceptions to the number of subcostal branches in the group are presented by two or three small species of *Mesosemia**, in which the wing-neuration is very aberrant; these, however, offer no practical difficulty in the employment of the character.

This first subdivision disposed of, we come to a group of species of peculiar *facies*, in which the number of subcostal branches varies from two to four, and even varies according to sex. These are the Eurygoninæ, which there is no difficulty in distinguishing from the other groups, by the mode in which the lower radial (discoidal) nervure is connected with the subcostal, especially in the lower wings; it is so perfectly connected that it seems to be a continuation or a lower branch of the subcostal. A trace of this important peculiarity is seen in the first subfamily; but in the remaining groups the nervure in question is completely detached, or united at a right angle to the subcostal by an imperfect nervule. This character leads us to place the peculiar genus *Methonella* in the Eurygoninæ group, which forms our second subfamily.

In all the rest of the family the subcostal nervure possesses only three branches, if we may set aside one or two species as anomalous exceptions; and the lower radial is disconnected from the subcostal, as just now explained. This division, which I call the subfamily Erycininæ, comprehends the great majority of the New-World genera; and although it is further divisible, the groups thus formed are not of the same rank as the three already defined. To subdivide it, I have taken, in the first place, the colour of the antennæ, separating those genera in which these organs are destitute of rings or spots of paler hue, from the remainder, in which they are more or less distinctly ringed. These two subdivisions seem to be tolerably natural; for the first comprehends every species in which the fore-wing subcostal nervure emits its second branch after the end of the cell, and the second excludes every such species, with one evidently aberrant exception, viz. *Helicopsis Cupido*.

* *M. tenera* and *M. idotea*.

Descriptions of New Genera and Species.

DODONA EUGENES.

♂. Closely allied to *D. Egeon* (D. & H. Gen. D. L. pl. 69. f. 2); wings of the same shape, and the form of the tail of the hind wings the same. Above dark, blackish brown. *Fore wing* with a narrow line across the middle (touching neither the costa nor the hind margin), a curved streak near the hind angle, and about thirteen small spots pretty equally distributed over the apical half of the wing; all these marks are whitish except the transverse line and marks near the hind angle, which are slightly tinted with reddish tawny. *Hind wings* with the outer portion traversed by four indistinct brownish-tawny lines, converging from the costa towards the anal angle; at the apex are two black spots edged with light brown. On the broad, square lobe at the anal angle is a quadrate black spot, a slender tail arising from its outer edge.

Beneath, the wings are precisely similar to those of *D. Egeon*, being tawny brown, with stripes and spots of white, silky and shining on the hind wing and costa of fore wing.

Expanse 1" 9''' ♂.

Nepaul and Bhotan. The species seems to have been confounded hitherto with *D. Egeon*; but the very different colour and small dimensions of the stripes and spots of the upper surface well distinguish it.

ALESIA LIPARA.

♂. Smaller than *A. Priolas*; fore wing much shorter, and outer border of hind wing not bowed outwards near the apex as in *A. Priolas*.

Above uniform dark purple; fore wing with scarcely any trace of the pale lines between the nervures towards the apex. Beneath pale brownish gray, much paler than in *A. Priolas*; nervures of the apical half of the fore wing, and lines between them, dark brown. Hind wing with seven small basal spots, and two narrow transverse lines, brown; a submarginal row of seven oblong black spots.

Expanse 1" 6'''.

Hab. Forests of the river Tapajos, Amazons.

ALESIA THELYDRIAS.

♂. Much smaller than *A. Priolas*, and quite distinct in the colours of the male, which resemble those of the females of this genus. Shape of the wings similar, but outer border of hind wing not expanded.

Above brownish tawny. Fore wing with the nervures and lines between them (those terminating on the outer border much thickened towards their terminations), and three short belts across the basal half, dark brown. Hind wing with four transverse belts, the outer margin, and fringe dark brown; besides which the submarginal row of black oval

spots of the underside shine through conspicuously. *Beneath* light brownish grey. Base of fore wing free from dark spots, except two minute specks behind the median nervures; apical half of the wings crossed in the middle by a dusky belt, nervures and lines between them dark brown, as on the upperside. Hind wing with six or seven small black specks towards the base, beyond the middle are two brown transverse lines.

Expanse 1" 2''' ♂.

Hab. Forests of the Cupari River, Tapajos, Amazons.

ALESA HEMIURGA.

♂. Smaller than *A. Priolas*. Dark brown, with a blackish-purple gloss.

Outer half of fore wing and outer border of hind wing paler. The pale streaks between the nervures of the fore wing are yellowish and are well-marked from the costa to the hind angle, but clearer in some specimens than in others. Hind wing with the marginal row of black spots visible on the upper surface and margined with yellowish.

Beneath paler than in *A. Priolas*, transverse streaks of hind wings much narrower. Cell of fore wings marked with two black spots.

♀. Smaller and lighter-coloured than *Priolas* ♀. Black markings the same, but of smaller dimensions.

Expanse ♂ 1" 3'''-1" 4''', ♀ 1" 2'''.

Hab. Ega, Upper Amazons.

ALESA TELEPHAË, *Boisduval*.

♀. Fore wing with the outer margin bowed outwards. Wings above lightish brown varied with paler spots; the markings (in the same position as the dark markings of the ♂) darker brown.

Hind wing with a row of submarginal triangular spots of a brilliant green hue edged with black, and each encircled by a yellow ring.

Beneath same as above, but paler.

This species was rare and found only at Ega, Upper Amazons.

MESOSEMIA SYLVINA.

♂. Closely allied to *M. Cippus* (Hewits. Exot. Butt. Mesos. f. 48, 49).

Wings very similar in shape and colours, the latter being brown, with darker brown streaks. The ocellus is moderately large, black, and with three glossy white specks—one large nearest the base, and two minute nearest the apex of the wing.

Differs, in the fore wing, in the two brown streaks nearest the ocellus converging towards the hind margin and in the submarginal streak being slender and strongly waved towards the apex; in the hind wing the central brown streak over the ocellus is absent, and the submarginal streak is slender, waved, and much thickened about the middle.

♀. Darker than the male, dark markings the same.

Hab. Pará and Obydos, Lower Amazons.

MESOSEMIA OLIVENCIA.

♂. Closely allied to *M. Metope* (Hewits. Exot. Butt. Mesos. f. 64, 65).

Wings, general colour, and ocellus very similar, but differs on the upper surface, in the fore wing, by the absence of the bluish grey subapical spot, and in the hind wing by two or three of the black streaks passing across the wing to the abdominal margin.

Fore wing above blackish brown, with darker ocellus, and near the outer margin a narrowish grey streak extending from the costa to the hind margin near the hind angle. Hind wing blackish brown on its basal half, the colour terminating in three wavy streaks which pass across the wing; three shorter dark streaks extend a short distance from the apical margin; rest of wing white, except near the dark streaks, where it is bluish grey.

Beneath light brown; ocellus with two dark streaks on its inner side and three on its outer side; beneath the ocellus there are three streaks on each side, the inner of which meet before the hind margin; outer half of the fore wing without dark streaks, but having a narrowish white belt extending from the costa to the hind margin, near the hind angle. Hind wing light brown, outer border broadly white. Across the disk (and the central black spot) is a broad darker brown belt, the rest of the brown part crossed by numerous fine, wavy, dark brown streaks. A macular line traverses the white hind border.

Hab. St. Paulo de Olivençia, Upper Amazons.

MESOSEMIA PHILOCLES, Linn.

This species occurs under three distinct forms in the Amazons region, none of which accord very closely with the figures of Clerck and Cramer; they are as follows:—

MESOSEMIA LÆTIFICA.

♂. The fore wing has a fine light-blue patch commencing in a point near the base, enlarging towards the ocellus, and, beyond it, curving round and ending in a point at a short distance from the hind angle. The hind wing has a large space on the disk of a light-blue colour, and five short black streaks proceeding from the costa, the submarginal one sometimes extending in a broken line to the anal angle. Beneath, the dark submarginal line of the fore wing extends from the hind angle to the costa.

Common at Pará.

MESOSEMIA PHILOCLES, Cram. t. 184. f. D, E (not f. F, which = *Traga*, Hewits.).

♂. The blue patch of the fore wing has the same extent as in Cramer's figure, and shades into white exteriorly in the same way. The hind wing also resembles Cramer's figure in the almost entire absence of the discal blue, the thickness of the costal streaks, and the double black marginal lines. My specimens differ on the underside from

Cramer's figure, in having on the fore wing a dark submarginal line extending from near the hind angle nearly to the costa. This may have been accidentally omitted in Cramer's figure.

♀. Light brown, with dark streaks crossing the wings.

Common near Obydos in Brazilian Guiana.

MESOSEMIA EGABELLA. *M. Philocles*, var., Hewits. Exot. Butt. Mesos. f. 62, 63 ♂, 61 ♀.

♂. The blue patch of fore wing commences about the middle of the cell and does not blend into white on its outer side; the ocellus is generally quite surrounded by the blue, and is quite destitute of irides or encircling lines. The costal streaks of the hind wing are much finer than in the true *Philocles*; there is no marginal brown line; and the submarginal line is distant from the outer edge of the wing and interrupted.

♀. Same as in ♀ *Philocles*, but outer border of hind wing broadly white.

The Upper Amazons race of *Philocles*. Common at Ega.

MESOSEMIA CALYPSO.

♂. Same form of wings as *M. Philocles*. Above dark blue, glossy and opalescent. Fore wing crossed by six black belts, two of which are curved and enclose the black ocellus, which has a single white pupil. Hind wing crossed by seven black belts.

Beneath light brownish grey; dark belts same as above, but brown in colour. Fore-wing ocellus having three white specks—one larger, central, and two minute external; the ocellus surrounded by a fine brown ring. Hind-wing ocellus small, black, with grey iris, in middle of the third brown belt.

Ega; rare. Allied to *M. antærice*, Hewits.

EURYGONA COCCINELLA.

♂. Closely resembles *E. Zena*, Hewits. (Exot. Butt. Eu. f. 74 & 76), but is much smaller, with the fore wing broadly truncated at the apex, and the hind wing shorter and regularly rounded. In *E. Zena*, ♂, the hind wing is bisinuate near the anal angle. Above deep black. Fore wing with a rounded crimson spot in the middle near the hind margin, the spot not occupying more than about one-third of the surface of the wing. Hind wing with a small rounded crimson spot towards the anal angle.

Beneath brown, with two white submarginal belts as in *E. Zena*; the outer belt of hind wing is strongly curved in the middle, and again forms two lunules near the anal angle; the marginal space near the anal angle, and a line near the hind angle of fore wing, are yellow.

♀. Hewitson, Exot. Butt. Eu. f. 75, as *E. Zena* ♀.

Hab. Upper Amazons, at Tunantins and St. Paulo.

EURYGONA ERYTHRÆA.

♂. Similar in shape and colour to *E. Zena*. Deep black; fore wing with the median area crimson, separated from the hind margin only by a narrow black line. Hind wing with a large rounded crimson spot near the anal angle and close to outer margin; the spot occupying about one-third of the surface of the wing.

Beneath dark brown, with *three* pale submarginal belts. The outermost belt on the hind wing is a little waved and subinterrupted, but forms no lunules. There is a very narrow orange streak near the anal angle; on the fore wing there is no yellow streak near the hind angle.

Hab. Tunantins, Upper Amazons.

EURYGONA CALLIGRAMMA.

♂. 1" 6". Wings of same shape as in *E. Euritaus*, Cram. Above dark brown, deeper towards the base. Hind wing with three white marginal sinuses. Beneath pale brown, crossed by five dark brown belts (including the marginal edging); along the subcostal nervure of the fore wing is an orange streak extending down the basal part of the hind wing. The space between the 1st and 2nd and 3rd and 4th brown belts is lighter in hue, and between the 4th and 5th belts on the hind wing is clear ochraceous yellow. The third belt on the hind wing has two large square black spots about the middle; and the space between it and the 2nd belt is there much wider and yellower in colour.

Antennæ whitish beneath, spotted with black, club ringed at the base with white. Palpi whitish, legs buff-coloured.

♀. 1" 6". Dull light brown above. Beneath, same as in the male, but paler.

Hab. Ega, Upper Amazons.

EURYGONA CHARILIS.

♂. 1" 8". Wings broader than in *E. Euritaus*, Cram. The wing obtuse, and broadly rounded at the apex. Hind wing broad; outer margin subsinuate. Above uniform dark brown, fringe included, with a rich purple gloss in certain lights.

Beneath lighter brown, crossed by two broad ruddy-brown belts; fore wing having besides a broad outer border of the same colour; the spaces between the belts, and the inner side of the first belt, lighter than the ground-colour.

In the hind wing the 2nd brown belt is on its outer edge variegated by a series of orange lunules edged on their outer sides with black. In the middle of this row of lunules is a large deep-black spot; and exterior to it is a waved whitish line, extending from the apex to the anal angle of the wing, and edged on the outer side with black. The outer border is orange, and is very broad near the anal angle.

♀. 1" 10". Above uniform dullish brown. Beneath same as in the male, except that the row of orange lunules of the outer brown belt

of the hind wing is expanded into a broadish belt, and that there is an orange line near the hind angle of the fore wing.

Antennæ beneath grey, spotted with black. Palpi and legs pale buff.

Hab. Tunantins and St. Paulo, Upper Amazons.

EURYGONA ANGULATA.

♂. 1" 7^{'''}. Fore wing with the outer margin forming in the middle an obtuse angle. Hind wing subcaudate in the middle of the outer margin. Above dark brown. Beneath purplish brown, crossed in the middle by a darker, somewhat ill-defined belt, succeeded by a second similar one, but still more indistinct, and having a submarginal indistinct waved line of the same dark-brown hue. Palpi and legs yellow. Antennæ reddish brown, club dusky.

♀. 1" 10^{'''}. Lighter brown, wings angulated as in the male. Hind wings broader, outer margin bisinuate between the apex and the caudiform lobe, and again faintly bisinuate between the lobe and the anal angle. Beneath, the same.

Hab. St. Paulo, Upper Amazons.

EURYGONA MIRANIA.

♂. 1" 3^{'''}. Size and shape of *E. Eubæa*, Hewits. (Exot. Butt. Eu. f. 4, 5).

Wings above dark brown, hind wing regularly rounded and festooned, fringe of fore wing and sinuses of hind wing white. Beneath light brown, crossed in the middle by an orange streak, edged on the inner side with yellowish and the outer side with dark brown, and flexuous on the hind wing. Close to the outer margin of hind wing is a row of 7-8 pure-white lunules edged with black, the space between them and the border being tawny orange.

♀. The same, but much lighter brown above. Forehead and palpi white, tibiæ and tarsi orange-yellow.

Common at Ega.

EURYGONA MODESTA.

♂. 1" 8^{'''}. Fore wing obtusely truncated at the apex; hind wing much elongated, but anal angle not produced, rounded, abdominal edge straight, outer margin rounded. Above dark brown, lighter beyond the middle of fore wing. Beneath light brown, lighter towards the outer margin, nervures darker; both wings crossed a little beyond the middle by a line a little darker than the ground-colour; an indistinct row of submarginal dusky lunules to both wings.

♀. 1" 10^{'''}. The same, but lighter in colour above.

Antennæ brown, ringed with orange brown; club without white ring.

Forehead dark brown, palpi and legs clear orange.

Hab. Forests of the Tapajos, rare.

EURYGONA FERRUGO.

♂. 1" 10^{'''}. Same shape and size as *E. Eutyclus* (Hewits. Exot. Butt. Eu. f. 44). Above, basal half of wings black glossed with dark blue;

this followed by a broad glossy blue belt, which forms the outer border on the hind wing; apical part of fore wing dark brown. Beneath light brown; base of wings with a short blackish streak; centre of wings crossed by two rusty-red belts, the outer one four times the width of the inner. Outside of the broad belt, on the fore wing, is a row of three subapical, triangular, black spots, and between them and the inner margin a third rusty belt; on the hind wing there is a row of large, acute-triangular brown spots edged on the inner side with yellowish, and having in the middle a large black ocellus edged on the outer side by a white lunule. The outer border of the hind wing is broadly orange, and the anal angle tinged with glossy purple.

Face, palpi, and legs tawny yellow, forehead brown, with two yellow lines. Antennæ ringed; club black.

Hab. Ega.

This species is closely allied to *E. Eutyclus*, differing only in the markings of the underside. It might be considered a mere aberration in which the two outer belts were blended into one, were it not for the broad orange outer border of the hind wing, destitute of fine marginal lines.

EURYGONA CLITHRA.

♂. 1" 10". Same shape and size as *E. Eutyclus* (Hewits. Exot. Butt. Eu. f. 44). Wings above black, crossed by a dark-blue belt very much narrower than in *E. Eutyclus*, and extending round the outer margin of the hind wing; fringe black. Beneath, fore wing crossed by five rusty-brown stripes as in *E. Eutyclus*, and having three black subapical spots. Hind wing with the basal half white, crossed by two rusty-red belts; apical half rusty brown, with a row of sharp angular spots; central ocellus and yellow submarginal line as in *E. Eutyclus*, the only difference being that the white ground-colour in the middle of the wing forms a broad belt, gradually widening from the costa to the abdominal margin.

♀. 1" 10". Light brown, disk of hind wing broadly whitish with the black ocellus shining through. Beneath, same as in the ♂.

Hab. Pará, also at Montes Aureos, interior of Maranhão.

EURYGONA EXTENSA.

♂. 1" 7". Length of hind wing $8\frac{1}{2}$ ". Closely allied to *E. eubotes*, Hewits. (Exot. Butt. Eu. f. 64); differing in its much larger size and especially in the great length of the hind wing, which, however, is not produced or acute at the anal angle. Above dark brown, glossed with purple, slightly paler on disk of fore wing. Beneath light brown, glossed with lilacine. Wings crossed, much beyond the middle, by a dark red-brown unwaved stripe, followed by a very indistinct dark stripe. The fore wing has besides a distinct, interrupted, dark submarginal line. The hind wing has a row of 9 white submarginal

spots, edged on the inner side with black triangular spots, the 4th being much larger, and the space between them and the hind margin orange tawny.

Palpi and legs tawny yellow; face tawny yellow, with a black central stripe.

♀. 1" 8^{'''}. Fore wing subtriangular, with slightly produced apex, as in ♂. Hind wing not elongated, broadly rounded, with festooned margin. Above light brown. Beneath light lilacine brown; wings crossed beyond the middle by a straight rusty-brown streak, and near the margin by a broad undefined brown stripe, after which, on the fore wing, is a row of very slender dusky angulated lines, and on the hind wing a row of black mostly triangular spots, the fourth of which is much larger than the others.

Face white; palpi, tibiæ, and tarsi orange-yellow.

Hab. St. Paulo, Upper Amazons.

EURYGONA VIOLETTA.

♂. 1" 3^{'''}. Allied to *E. Arbas*, Cram. pl. 379. Smaller; hind wings shorter. Above blackish brown, fore wing with a large rounded glossy blue patch in the middle of the outer border; hind wing with a streak of similar colour along the abdominal edge, widening at the anal angle, the blue gloss seen only in certain lights. Beneath rusty reddish brown, lighter towards the inner margin of the fore wing; wings crossed in the middle by an orange stripe, edged on each side with brown, and biflexuous on the hind wing. The hind wing has a submarginal row of acute spear-shaped orange streaks, each arising from a black spot, and in the middle of them a large blue-black ocellus; exterior to these is a brown continuous submarginal line.

Palpi and legs tawny; face brown, margined with yellow.

Hab. Forests of the Tapajos.

THEMONE PÆCILA.

♂. 1" 7^{'''}. Same size and shape as *T. Pais*; hind wing with the outer margin regularly rounded and festooned, with white fringe in the sinuses. Above black; a broad orange belt near the base, commencing within the cell of fore wing and extending to the abdominal margin of hind wing; an oval testaceous-yellow spot across the disk of fore wing beyond the middle, and a smaller one on the hind wing half-way between the orange basal belt and the outer margin.

Beneath, the same, except that there are a white apical spot and several marginal ones on the fore wings. Body, antennæ, and legs blackish.

Hab. Ega.

CHAMÆLIMNAS IÆRIS.

♂ & ♀. 1" 6^{'''}. Fore wing elongate, broadly rounded at apex; hind wing short, anal angle not passing the tip of the abdomen. Above black, fore wing crossed by an oblique yellow belt of uniform width

and not reaching either the costa or the outer margin; apex edged with yellow, preceded by a plumbageous spot. Beneath, the same. Body, antennæ, and legs black. A yellow spot behind each eye, and on the side of the collar.

Hab. Ega; common.

CHAMÆLIMNAS BRIOLA.

♀. 1" 8". Same shape as *C. Iæris*. Black; fore wing with a triangular spot at the base of the cell, and an elongate-oval oblique spot beyond the cell, yellow. Hind wing with the discal area yellow. Apex of the fore wing edged with yellow. Beneath, the same.

Antennæ, body, and legs black.

Hab. River Ucayali (*Mr. Edw. Bartlett*).

SYRMATIA LAMIA.

♂ & ♀. 1" 2". Closely allied to *S. Dorilas*, Cram., and *S. Asteris*, G. R. Gray (Griffith's An. King. pl. 102). Deep black. Wings crossed near the base by a white belt, beginning in a point at the fore-wing median nervure, and widening to the hind-wing abdominal edge; disk of fore wing with an oblong-oval glossy white spot. Tips of tails white.

Body, antennæ, and legs black.

Hab. Ega.

PHELES RUFOTINCTA.

♂. 1" 8". Same shape and size as *P. Heliconides*, Herrich-Schäffer (Exot. Schmett. fig. 30). Black; basal half of the fore wing with three elongate hyaline spots, and apical part with five shorter and similar spots, but with the outer portion orange-coloured and opaque. Hind wing with the outer margin only black, the rest being hyaline, divided by the black nervures; an orange stripe extends along the costa and on the inner side of the outer borders, interrupted by the black nervures.

Body, legs, and antennæ black.

Hab. Ega.

ESTHEMOPSIS CELINA.

♀. 1" 5". Fore wing with costa and outer margin regularly and moderately rounded, apical angle obtuse. Hind wing a little longer than abdomen, outer margin rounded. Fore wing blackish, with a large triangular diaphanous basal patch divided into three elongated spots by the black median nervure and its first branch; apical portion of the wing traversed by a short belt or elongate spot of a pure milk-white hue. Hind wing blackish, with the central and basal portion diaphanous, traversed by the blackish nervures; space between the 2nd and 3rd median branches greyish black.

Beneath, the same as above.

Body greyish; palpi, thorax, and legs yellowish. Fore-wing upper radial nervure joining the subcostal at a distance from the end of the cell, as in *E. Clonia*.

Hab. Ega.

ESTHEMOPSIS ÆOLIA.

♀. 1" 5". Same size and shape as *E. Celina*; differs chiefly in the subapical belt of fore wing being crossed by three black nervures. Fore wing with costal and outer border rounded; apical angle obtuse; hind wing a little longer than the abdomen. Above blackish; fore wing with a large diaphanous basal patch divided by the black median nervure and its first branch; apical portion of the wing with an irregular diaphanous belt, or a series of four spots, of which the three upper are elongated and the lowermost rounded and separated from the rest by a broader black space. Hind wing greyish diaphanous, with darker outer border.

Beneath, the same. Palpi, legs, and thorax yellowish.

Hab. Banks of the Cupari River, Tapajos.

ESTHEMOPSIS LITHOSINA.

♀. 1" 8". Wings more elongated. Fore-wing costa arched, outer margin very much bowed outwards, apical angle obtuse. Hind wing elongated, outer margin from the apex to the anal angle nearly straight. Both wings black, the centre of the basal half of the fore wing diaphanous, traversed by the black median nervure, its 1st and 2nd branches, the discocellular nervule, and a line down the middle of the cell; an elongate milk-white spot or short belt near the apex. Hind wing with the central area diaphanous, divided by black nervures.

Head and palpi ochreous yellow, legs and body blackish, breast white.

Discocellular nervule of fore wing uniting with the upper radial after its junction with the subcostal.

Hab. Tunantins, Upper Amazons.

LIMNAS FLAMMULA.

♂. 2". Closely allied to *L. Zoëga*, Hewits. (Exot. Butt. Lim. f. 2).

Wings rich dark purple brown, with the nervures rather paler. A large triangular apical spot on the fore wing, and a moderately broad outer border to the hind wing (not reaching the apex), orange-yellow; a crimson spot near the base of both fore and hind wing.

Beneath, the same, except that there is a crimson spot also on the costa of the hind wing near the base.

Body, antennæ, and legs blackish brown.

Hab. Ega; rare.

LIMNAS SEMIOTA.

♂. 2". Fore-wing costa arched near the base, thence slightly incurved, and arched again before the apex, apical angle slightly produced,

acute; outer margin very slightly curved outwards. Hind wing with apical angle obtuse, rounded. Above rich purplish black (nervures concolorous), with a belt of rich yellowish orange crossing the fore wing slightly beyond the middle and very nearly touching both the costa and the hind angle.

Beneath dark brown, nervures concolorous; belt of fore wing saffron-yellow.

Body, legs, and antennæ blackish. The antennæ are more slender than in *L. Melander* and allies.

Hab. Banks of the Tapajos, at Altar do Chaõ.

ORESTIA TAPAJONA.

♂ & ♀. Closely allied to *O. vitula* (*Limnas vitula*, Hewits. Exot. Butt. Lim. f. 5). Shape and size the same; differs in the wing-lappets being of an orange colour instead of black like the rest of the thorax. The orange stripe of fore wing extends much further towards the hind angle than in *O. vitula*. The subapical buff-coloured fascia is very irregular in shape, being sometimes oblong-ovate, sometimes narrow and elongate as in *O. vitula*, and sometimes it is quite absent.

Hab. Forests of the Tapajos. *O. vitula* is peculiar to the Upper Amazons.

Genus ZELOTÆA, nov. gen.

Fore wing short, broad, subtriangular, with slightly bowed costa and distinct apical angles; hind wing elongate from the base to the anal angle, outer border regularly rounded. Fore-wing subcostal nervure terminating at the apex of the wing, three-branched—two branches before the end of the cell, and the third halfway between the cell and the apex; upper radial joining the subcostal at a distance from the end of the cell; lower radial midway between the subcostal and median nervures, and middle discocellular nervure running obliquely to the subcostal. Palpi straight, pointed, but not visible from above (♂). Antennæ short, light brown, very obscurely spotted above with grey; club thick and distinct, gradually formed. Front legs of ♂ extremely short, especially the femora and tarsi, thinly clothed with scales and a few hairs; middle and hind legs moderately short and thinly clothed with scales; tarsi not perceptibly spined.

These species have a peculiar appearance from their pallid coloration, whitish or grey, varied with darker grey, especially along the nervures. Although similar to *Pandemos* in colours, the much shorter legs and the extremely reduced male fore legs show that there is no real or close affinity between the two genera. The affinities are rather with *Helicopsis*.

ZELOTÆA PHASMA.

♂. 1" 4". Fore-wing costa arched; apex subacute; outer margin moderately rounded. Wings above pallid greyish white; fore wing with the nervures, a broadish costal border, a belt crossing the wing beyond the cell from the costa to near the hind angle, a fine submarginal line, and the outer edging pallid brown. Hind wing with the nervures and a submarginal line parallel to the outer border pallid brown.

Beneath darker in colour, and nervures more distinctly bordered with brown.

Body and legs ashy white. Antennæ pallid brown, spotted above with ashy; club pale ashy.

Hab. Ega.

ZELOTÆA DUBIA.

♂. 1" 4". Very similar to *Z. phasma*. Wings greyish white, with the pallid-brown markings of fore wings much fainter. Hind wings without the submarginal brown line.

Beneath darker than above, with the fore-wing costal border and a broad apical and outer border light brown. Hind wing with a narrowish light-brown border.

Hab. Pará.

This species might range as a geographical form of *Z. phasma*.

ZELOTÆA ACHROA.

♂. 1" 6". Fore-wing costa very slightly arched, apex subacute, outer border nearly straight. Fore wing above light brown, with the outer border and two or three rounded spots on the disk pallid whitish; the pale outer border has a subinterrupted brown line down its centre and parallel to the margin; the discal spots are between the branches of the median nervure, the submedian, and lower radial. Hind wing pallid ashy white, with the nervures irregularly bordered with brown.

Beneath, the same, but darker, and the hind wing has a brown outer border. Antennæ brown, scarcely spotted.

Hab. Forests of the Tapajos.

Genus DYSMATHIA, nov. gen.

Closely allied to *Zelotæa*; but the upper radial emitted at the end of the cell. Antennæ moderately short, pale brown, ringed with paler brown, distinctly and rather strongly clubbed. Palpi porrect, not visible from above. Fore legs in male thinly clothed with scales; tarsi more elongated than in *Zelotæa*, pointed. Wings varied with dark streaks and submarginal rows of spots. In one species (*D. costalis*) the fore-wing costa is very strongly bowed, and the hind wing prominent at the anal angle.

DYSMATHIA PORTIA.

♂. 1" 6". Fore wing triangular; costa arched only near the apex, the latter acute, outer border nearly straight; hind-wing outer border and anal angle rounded. Above dull brown, varied with pale slaty blue; a submarginal row of black spots encircled with slaty blue on both wings; disk of wings with a large number of black spots between the nervures.

Beneath pale brown, with the black spots and marks smaller and less distinct.

Body brown. Antennæ pale rufous brown, spotted above with darker brown.

Hab. Pará.

DYSMATHIA COSTALIS.

♂. 1" 6". Fore-wing costa very strongly arched in the middle, apex obtuse; hind wing with anal angle prominent, obtuse. Above pale ashy brown, rufous towards the outer margins, fringe brown. Fore wing with three blackish streaks across the cell, and three between the median and submedian nervures; beyond the cell is a line of blackish lunules commencing on the costa and crossing the wing, strongly bent outwards, to the first branch of the median; nearer the outer margin is a more or less indistinct submarginal dark-brown streak. Hind wing crossed by six dark-brown lines, the fourth of which is bent and interrupted.

Beneath light bluish grey, crossed by lines similar to those above, but with the addition of a submarginal row of rounded spots on both wings.

Antennæ ashy white, ringed with brown.

Hab. Ega.

ZEONIA SYLPHINA.

♂. 1" 10". Closely allied to *Z. Xanthippe*, G. R. Gray (Griffith's An. King. Ins. vol. ii. pl. 102. f. 1). Tail of the hind wings and anal lobe much shorter. Above black; a broadish diaphanous belt crosses both wings at a short distance from the base, and is crossed on the fore wing by the black median nervure and the beginning of its first branch and by the postmedian nervure, and on the hind wing by the costal and median nervures; the margins of the diaphanous belt are quite straight. There is also a broad triangular diaphanous area on the apical half of the fore wing, crossed by six nervures, and a submarginal spot of the same near the apex of the hind wing, crossed by two nervures. The hind wing has a crimson streak commencing at the base, extending along the abdominal edge, bending long before reaching the anal angle, and terminating at the median nervure. The black anal portion has a flexuous stripe of silvery blue. The anal lobe is short and broad, tipped with white. The tail is only 4 lines long, and tipped with white.

Beneath, the same.

Hab. Interior of Ecuador.

SISEME XANTHOGRAMMA.

♂. 1" 6". Same shape as *S. Pallas*, Latr. (Humb. & Bonpl. Zool. pl. 24. f. 7, 8). Differs in the wings being lightish brown, crossed by a saffron-coloured belt, as in *S. Aristoteles*, Latr. (l. c. f. 5, 6). Above light brown, the outer portions lineated with blackish, both wings crossed before the middle by an ochreous-saffron-coloured belt, widening from the fore-wing costa to the junction of the wings, and narrowing again towards the hind-wing anal angle, which it does not reach. The belt is bordered with black, and is succeeded near the anal angle by a triangular tawny-orange spot. The fringe is blackish, on the hind wing spotted with white. The hind wing is obtusely angular, but not produced into a caudiform lobe.

Beneath, same pattern, but much paler; differs greatly from *S. Aristoteles*, which has the outer half of the wings beneath darker, traversed by a light-brown belt.

Hab. Tarapoto, East Peru (*Dr. Spruce*).

SISEME SPRUCEI.

♂. 1" 6". Hind wing neither lobed nor angulated, feebly scalloped, with white fringe in the sinuses. Above dark olive-brown; both wings crossed by two pale brown stripes, one across the middle and the second midway between the middle and the apex. Hind wing with a row of three crimson spots near the anal angle.

Beneath, the same, except that the belts are whitish and the whole basal area of both wings is ashy white.

Hab. Valleys west of Chimborazo, alt. 3000 ft. (*Dr. Spruce*).

SISEME CAUDALIS.

♂. 1" 6". Closely resembles in colours *S. Pallas*. Differs in the hind wing being elongated near the anal angle, and forming a distinct caudal lobe. Above black; both wings crossed before the middle by a broadish belt of pure white, narrow near costa of fore wing; outer portion of wings grey in the middle, traversed by black lines. Hind wing with a large transverse red spot at the anal border. Margins of the caudal lobe spotted with white.

Beneath, the same, but a little paler.

Hab. Moyobamba, Peru (*M. de Gand.*).

ERYCINA MINIOLA.

♂. 2". Closely allied to *E. Melibæus*, F. (*Pyretus*, Cram.),—having, like that species, a white spot above near the base of the costa of the hind wing. Differs in the fore wing being conspicuously broader near the apex, and in the hind wing being greatly elongated, forming a caudal lobe as long as that of *Diorhina Periander*, Cram. (*Laonome*, Bdv.). Fringe of fore wing, as well as of hind wing, varied with white. Crimson belt twice the width of that in *E. Melibæus*; the red anal stripe also much longer, and with angulated edges.

Hab. Ega.

EMESIS SPRETA.

♂ & ♀. 1" 10". Differs from *E. Lucinda*, Cram. (Pap. t. 1. f. E, F), in having narrower wings, with the outer margins much less rounded,—and in colour, being dullish slaty brown, with an indistinct rufous-brown patch near the apex of fore wing, in both sexes. The white subapical spots of *E. Lucinda* ♀ are entirely wanting in the ♀. The black markings are very similar.

Hab. Ega, Upper Amazons; common.

EMESIS HYPOCHLORIS.

♂. 1" 9". Fore-wing costa incurved in the middle, apex very slightly produced; anal angle of hind wing fringed with long silky hairs. Above black, both wings crossed by six belts of a dark glossy slaty blue, the marginal one of hind wing being of a lustrous plumbageous hue; fringe pure white, spotted with black near apex of fore wing. Beneath, dark glossy blue; brilliant glossy cyaneous towards the outer margins.

Abdomen bright red beneath. Antennæ black above; beneath brown, obscurely spotted with black.

Hab. Ega.

This species has the coloration of many species of *Charis*; but the shape of the wings is that of *Emesis*; the naked eyes and unringed antennæ also remove it from those species of *Charis* which it most resembles.

EMESIS ÆTHALIA.

♂. 1" 9". Dark sooty-brown above and beneath. Fore wing incurved in the middle, apex very slightly produced and obtuse, outer margin scarcely rounded. Hind-wing outer margin gently rounded, anal angle slightly advanced. Above crossed by numerous short dusky streaks, which on the outer half of both wings unite to form three slender undulating belts—one near the cell, and the other two submarginal.

Beneath a little paler than above, dusky streaks much more slender, submarginal belt converted into a row of small spots.

Head, body, and legs sooty-brown.

Hab. Santa Martha, New Granada. Collected by the late M. Bouchard.

CRICOSOMA ERASTE.

♂. 10". Fore-wing costa straight until near the apex, where it is bowed, apical angle acute; outer margin of both wings gently rounded. Above rich orange-yellow; costa and base of wings edged with black; the basal half of both wings is varied by short black streaks, of which there are two rows; the apical portion is crossed by three continuous black streaks, the last of which is marginal.

Beneath pale.

Head and thorax dark brown; wing-lappets and abdomen orange.

Hab. Ega.

CRICOSOMA PHÆDRA.

♂. 1" 2". Fore-wing costa very slightly arched to three-fourths of the length, then more strongly bowed to apex; apical angle obtuse; outer margin of both wings curved outwards near the apex and becoming straight towards the hind angle. Above rich orange, varied with a number of small blackish spots which become larger towards the outer margins; four of them form elongate streaks crossing the fore-wing cell from the costa; and the outermost form a submarginal row of spots, which on the hind wing are united into a continuous line. Fringe dark brown.

Beneath, the same, scarcely paler.

Head and body wholly orange-coloured.

Hab. Forests of Tapajos.

MESENE SOPHISTES.

♂ & ♀. 1". Resembles *M. cingulus*, Stoll (Suppl. Cram. t. 13. f. 4), but wings varied with spots encircled by light-brown lines. Apex of fore wings acute in both sexes. Above brown; basal portion of both wings varied by oblong brown spots margined with buff; a row of similar spots near the outer margins; across the middle of each wing is a red belt which is not continuous from one wing to another, and is much broader on the fore wing, especially towards the costa. Fringe brown, varied with ashy white.

Beneath much paler, and the buff circles and marks broader and more numerous.

Hab. Upper and Lower Amazons.

MESENE FULIGINEA.

♂. 1". Size and shape of *M. Ærope* (Dbld. and Hew. Gen. D. L. pl. 71. f. 2), wholly sooty-black above, with fringe of fore wings varied with white.

Beneath brown, varied with darker-brown markings or spots, which form more or less regular belts across both wings.

Hab. Villa Nova, Amazons.

MESENE PYRSODES.

♂. 1" 2". Closely allied to *M. Ærope* (Dbld. & Hew. Gen. pl. 71. f. 2); shape of wings very similar, but fringe wholly black. Above black, disk of wings occupied by a large, rich-crimson common spot, which scarcely extends to the subcostal on fore wing, and approaches very nearly to the abdominal edge of the hind wing; its upper margin on fore wing is indented, and it lies much nearer the base than the outer margin.

Beneath dingy brown, with no trace of red spots, except near the inner margin of the fore wing, which has a pallid-rufous cloud; the basal portion of both wings is varied by a number of short dusky streaks; and there is a submarginal row of larger dusky spots on both wings, preceded by bluish lunules.

Hab. Ega.

MESENE LEUCOPHRYS.

♂ & ♀. 1" 2". Closely allied to *M. Phareus*, Cram. (Pap. t. 170. f. C).

Above black; disk of wings occupied by a large red spot, leaving broad black costal and outer borders; the costal edge of the spot on the fore wing is indented by the black costal streaks which the species has in common with *M. Phareus*; in the middle of the outer border of the fore wing, near the margin, is a large white spot.

Beneath, the same as above, with the addition of two white spots in the black border of the hind wing.

This species varies much. Sometimes the black borders are no wider than in *M. Phareus*; and the amount of red on the under surface of the fore wing is very unstable. The abdomen, generally black, is sometimes more or less red. The species is found on the Upper and Lower Amazons.

MESENE FENESTRELLA.

♂. 1". Similar to *M. Hya* (Dbldy. & Hew. Gen. D. L. pl. 70. f. 9).

Same size and shape. Above black, with a common crimson discal spot extending close to the base, and including the abdominal edge of hind wing; upper edge, in the fore-wing cell, quite straight and even.

The black apical portion of fore wing has in the middle a white spot.

Beneath, the same, with the addition of two white spots in the hind-wing border.

Head, thorax, and wing-lappets black; abdomen red.

Hab. Ega.

This species is quite distinct both from *M. Hya* and *M. leucophrys*.

MESENE PARAENA.

♂. 1". Probably a geographical form of *M. fenestrella*. The red spot is much larger, extending to the base of the wing and very nearly to the fore-wing costa, and leaving a narrow black border to the hind wing. Colour of the body the same.

Hab. Pará.

MESENE SIMPLEX.

♀. 1". Similar in form to *M. Phareus* ♀. Above ochreous saffron-colour, with narrow black outer borders, which on the fore wings extend a short way along the costa from the apex.

Beneath, the same.

Head and body entirely ochreous saffron-colour.

Hab. Pará.

MESENE CELETES.

♀. 1" 3". Differs from *M. Phareus* in the wings being more elongated; the outer margin of the fore wing is much bowed outwards, and the fringe spotted with white. Above of an ochreous saffron-colour, with broadish black border to the fore-wing costa and to the outer margins

of both wings; the costal border is a little indented, and the outer borders slightly sinuous.

Beneath, the same, except that the outer border of the fore wing has one, and that of the hind wing two white spots, sometimes obsolete or wanting.

Head black; thorax and abdomen ochreous saffron; wing-lappets bright orange.

Hab. Pará.

MESENE BASILISSA.

♂. 1" 2". A robust species, with broad stout thorax; fore-wing costa slightly incurved in the middle, hind-wing prolonged from base to anal angle, and outer margin nearly straight. Above black, disk of wing crossed by a broad reddish-orange belt, beginning within the fore-wing cell, and extending to the abdominal edge, indented on its inner (basal) side and in the fore-wing cell, with the black ground-colour. Fringe black.

Beneath rather lighter; both the dark ground-colour and the orange belt varied with lighter and darker markings.

Head and thorax black; face, palpi, and abdomen orange; legs grey.

Hab. Pará; one example.

MESENE DEBILIS.

♂ & ♀. 10". Similar to *M. Sagaris*, Cram. (Pap. t. 83. f. D), but very much smaller, and body much less robust. The fore-wing costa is gently arched, without incurvation; and the anal angle of hind wings is less prominent, and the middle of the outer margin rounded. Above dark brown, with indistinct submarginal darker spots; an oblique, subtriangular, common orange spot, beginning at the fore-wing median nervure and curving towards the base of hind wing; sometimes it is prolonged on fore wing nearly to the costa.

Beneath brown, prettily variegated throughout with ashy white, and with a yellow spot near inner margin of fore wing.

Body brown, abdomen in the ♂ orange. Palpi, forehead, and legs yellow.

Hab. Forests of the Tapajos.

MESENE CROCOSTIGMA.

♂. 1" 3". Same shape as *M. Sagaris* ♂ (Cram. Pap. t. 83. f. D). Above dark brown, varied with obscure blackish transverse streaks. Hind wing with a large transverse oblong spot across the disk, rich orange.

Beneath black, richly glossed with blue.

Head, body, and legs black.

Hab. Tunantins, Amazons.

MESENE APOLECTA.

♂. 1" 2". Similar in colour to *M. crocostigma*. Hind wing much less elongate from base to anal angle than in *M. Sagaris* ♂. Above dark brown, varied with obscure blackish spots, those near the outer borders

forming a submarginal row. Fringe near apex of fore wing white, rest black. Hind wing with an oblong saffron-coloured spot across the disk and including the abdominal margin.

Beneath dark brown, with the darker spots much less distinct than above; the yellow spot of hind wing brighter than above.

Body brown.

Hab. Altar do Chão, R. Tapajos.

MESENE EUPTERYX.

♂. 1" 2". Wings elongated and narrow, more so than in *M. Nola*, H.-Schäffer (Exot. Schmett. f. 23). Anal angle of hind wing rather less prominent than the rounded outer margin. Above vermilion-red; outer border of fore wing very narrowly edged with black; outer margin of hind wing rather more broadly edged with black, which in some examples is dilated into spots towards the anal angle; the black border extends round the apex to the costa, and round the anal angle a short way up the abdominal edge.

Beneath reddish ochreous; black margins a little wider; apical half of fore wing black, with a large buff spot in the middle.

Head, palpi, and legs yellow. Thorax and abdomen orange.

Hab. Pará and banks of the Tapajos.

MESENE NYDIA.

♀. 1" 4". Possibly the ♀ of *M. eupteryx*, but the locality different. Wings elongated; above ochreous red, with a broadish outer and costal, and very broad apical, black border to the fore wing, and a broad indented outer border to the hind wing, extending a little along the costa and abdominal edge. The black apical part of the fore wing has a buff spot in the middle.

Beneath, the same.

Body orange; abdomen brown at the base; face, palpi, and legs yellow.

Hab. Ega.

MESENE PYRRHA.

♀. 1" 2". Closely allied to *M. Nola*, H.-Schäff. (Exot. Schmett. f. 23), of which both sexes are nearly alike in colours and markings; above rich orange-red, with a buff spot near middle of outer border of hind wing; the apical third of fore wing is deep black, but the margin of the black is very irregular and very deeply sinuated in its lower portion; in the middle it has a large buff spot. The outer edge of hind wing is narrowly black and has three black marginal spots, one at the apex and two at and near the anal angle. Fringe black.

Beneath, the same.

Head and body orange; face, palpi, and legs yellowish.

Hab. Ega.

Genus PACHYTHONE, nov. gen.

This new genus is formed to include a number of species very

similar in size and range of coloration to *Mesene*, but differing in the much more bulky thorax and abdomen, and especially in the abbreviated and thickly clubbed antennæ. The wing neurotation is the same as that of *Mesene* and the allied genera; the palpi are very short, not passing the lower edge of the frontal pad; and the hind wings are broadly rounded, with the outer margin on about the same level as the anal angle. The antennæ scarcely reach to half the length of the costa of the fore wing; their shafts are brown, spotted obscurely with ashy or lighter brown. Eyes naked. The male fore legs are very short, the other legs are moderately elongate and clothed with short scales.

The species are very rare.

PACHYTHONE EREBIA.

♂. 1" 2". Fore-wing costa incurved in the middle, sharply arched before the apex. Dark sooty brown, fringe white: above immaculate. Beneath paler brown, with a submarginal row of obscure darker spots and paler lunules on the hind wing.

Head, body, and legs sooty brown; tarsi white, tipped with black.

Antennæ dark brown spotted with ashy; club thick, oval, black.

Hab. Ega. Resembles in colours *Mesene fuliginea*.

PACHYTHONE LATERITIA.

♂ & ♀. 1" 3". Fore-wing costa very slightly incurved in the middle and gently arched before the apex. Above clear light brick-red, spotted with black, the outer margins also edged with black. The spots are elongated and arranged in two rows near the base, and on the outer half of both wings form three curved macular belts crossing the wings; one of them, passing a little beyond the cell, is more flexuous. Fringe black, costal border of fore wings brownish.

Beneath, the same, but paler, and the costa and apex of fore wing broadly bordered with brown.

Body above reddish, beneath whitish. Legs pallid. The antennæ in a well-preserved female example are dark brown ringed with ashy, and the club blackish; in a worn male the organs are pale rufous, obscurely ringed.

Hab. Tapajos and Ega.

PACHYTHONE DISTIGMA.

♂. 1" 3". Fore wing elongate triangular, costa slightly incurved in the middle. Above dark brown, including the fringe; the hind wing with a transverse oblong tawny-orange spot between the cell and outer margin, and not reaching the abdominal edge. Fringe dark brown.

Beneath paler; in both wings a submarginal row of regular rounded

blackish spots encircled with grey; orange spot of hind wings nearly obsolete.

Antennæ greyish, ringed with dark brown; club thick, ovate, black.

Body and legs dark brown; tibiæ and basal joint of tarsi whitish.

Resembles in colours *Mesene crocostigma*.

Hab. Pará.

PACHYTHONE XANTHE.

♂. 1". Fore-wing costa very slightly incurved in the middle. Above saffron-ochreous; fore wing with the costal border, apical portion, and outer border black; hind wing with a rather narrow black outer border, attenuated in the middle and near the anal angle. The black apical portion of the fore wing has in the middle an oval saffron-coloured spot; the costal border has two triangular projections into the wing-cell. Fringe black.

Beneath, the same, but paler.

Head and terminal joint of the palpi dark brown; face, rest of the palpi, thorax, abdomen, and legs yellow.

Hab. Ega, Upper Amazons.

PACHYTHONE MIMULA.

♀. 1" 3". Fore wing more elongated, costa incurved in the middle and arched again long before the apex; hind-wing outer border more advanced than the anal angle. Above dark brown; fore wing with a triangular yellow spot occupying the inner half of the basal portion, and an elongate yellow spot in the middle of the dark apical part. Hind wing with rather more than the basal half yellow, the colour occupying also a rather wide indentation in the dark brown outer border.

Beneath, the same, but paler.

Head and thorax brown; face, thorax, abdomen, and legs yellow.

Antennæ brown, obscurely spotted; club more slender than in the other species.

Hab. Santarem, Amazons.

CHARIS MONOGRAMMA.

♂. 1" 4". Similar in shape to *Ch. Cadmeis* (Hewits. Exot. Butt. *Charis*, f. 1); fore-wing costa broadly incurved in the middle, sharply arched before the apex, the latter produced and acute. Anal angle of hind wings a little produced, and, as well as the abdominal margin, fringed with long silky hairs. Above dark brown; both wings crossed by a rufous-tawny line extending from the middle of the fore-wing costa to the middle of the abdominal edge, where it is broader and of an orange tint. Fringe ruddy brown, white near the apex of fore wing.

Beneath, lighter and more ruddy, tawny line much broader. Antennæ and body dark brown, the former ringed with white. Eyes hairy.

Hab. On flowers, Santarem, Amazons.

The species differs from the hairy-eyed section of *Charis* in no

structural character; but its coloration is unlike that of the rest of the genus.

CHARIS LYPERA.

♂. 1" 6"". Very similar in shape and colour to *Ch. Cadmeis*, Hewits. (Exot. Butt. *Charis*, f. 1). Above, dark brown, with a number of short black lines across the interneural spaces, some of them uniting to form a flexuous line across both wings a little beyond the middle, a submarginal plumbaginous line to both wings; outer border slightly rufous, with a row of black spots attached to the plumbaginous line. Fringe spotted alternately with white and brown.

Beneath lightish olive-brown, much paler on the outer borders. Black markings as above, but no plumbaginous line.

Head, body, and legs dark brown. Antennæ dark brown, obscurely spotted with grey. Eyes hairy.

Hab. Ega.

CHARIS ZAMA.

♂. 1" 2"". Fore wing elongate-triangular, costa very slightly incurved in the middle, arched before the apex, hind wing triangular. Above dark rusty brown, the interneural spaces crossed by blackish spots; two plumbaginous lines parallel to the outer margins, the space between which is reddish and marked by a row of black spots; fringe spotted with black and white.

Beneath rusty tawny; hind wing darker. Basal part of fore wing crossed by short dusky lines; near the apex a small black spot, followed by a minute plumbaginous dot. Hind wing marked with numerous clearer black spots, and with a continuous plumbaginous line.

♀. 1" 2"". Above rusty brown, lighter than in the ♂, marked with numerous black spots, and with two plumbaginous lines having a row of black spots between them.

Beneath rusty tawny, black spots as above, and with a continuous submarginal plumbaginous line on both wings.

Eyes hairy.

Common throughout the Amazons, and in other parts of Tropical America. I cannot find a recognizable description or figure of this common species in any published work.

CHARIS ARGYREA.

♂. 1" 2"". Fore wing with the costa incurved in the middle and strongly arched before the apex; the latter produced, acute. Above nearly black, with indistinct darker spots; two glittering submarginal plumbaginous lines and a row of black spots between them. Fringe black, that of fore wing with three white spots.

Beneath, the same; black spots rather more distinct; the outer plumbaginous line interrupted.

Eyes hairy.

Hab. Ega.

CHARIS VENILIA.

♀. 1". Closely allied to *Ch. perone* (Doubl. & Hew. Gen. D. L. t. 71. f. 9), the sexes of which do not differ in markings. Wings of the same rich dark-yellow colour, with a glittering silvery-blue submarginal line, flexuous and interrupted on the fore wing and sometimes interrupted on the hind wing. Both wings sprinkled with a multitude of black spots, much larger than in *Ch. perone*, and of square shape; the spots unite near the apex and outer border of fore wing so as to form two thick irregular macular belts. Beneath paler, marginal silvery lines macular and partly obsolete.

Hab. Pará, Tapajos.

CHARIS GLAUCOPIS.

♂. 1" 3". Allied to *Ch. trochilia*, West. Fore wing triangular, costa and outer margin very gently arched, apical angle distinct; hind wing gently rounded outwards. Above black; base of fore wing and abdominal border of hind wing marked with oblique confluent dark red spots; a line very near the outer margin glittering silvery blue; the fore wing has a broad belt a little beyond the middle, commencing at the subcostal, of a rich cobalt-blue colour; two spots within the cell, and one beyond the belt, of the same hue; outer margins rufous, fringe dark brown.

Beneath dark brown, outer margins rufous, silvery lines interrupted. Numerous large quadrate black spots lie across all the interneural spaces; on the fore wing they are margined with blue-grey, and on the hind wing the spaces between the spots are wholly blue-grey.

Body dark brown; face yellowish; abdomen rufous at the base.

Hab. Ega.

SYMMACHIA AMAZONICA.

♂. 1" 7". Closely allied to *S. colubris*, Hübn. (Zutr. f. 251-2), a species of Southern Brazil. Above dark brown; a triangular space at base of fore wing, a broad belt across the middle of same wing (widest at costa), and a broad abdominal border to hind wing densely clothed with glittering golden-green scales. Between the two green patches of fore wing are two dusky bars and two spots; the belt is also margined externally by a black line. Near the apex of the fore wing is a red spot surmounted by a silvery one, and connected with a plumbeous submarginal line, between which and the outer border is a row of short dusky lines. In the hind wing the submarginal line is golden green, and does not reach the apex; it is followed by a rufous streak, in which is a row of short black lines.

Beneath blackish brown, with a slaty gloss, and indistinctly barred on the hind wing with black. There is a large crimson spot within the base of the fore-wing cell, and five or six irregular plumbeous spots

more or less near the costa, and placed at intervals from base to apex.

The shape of the hind wing varies greatly, the outer margin being sometimes quite straight and sometimes regularly rounded.

♀. 1" 7". Same disposition of metallic belts and lines as in ♂ : ground-colour lighter, purplish brown, and black cross bars thicker. The outer margins of both wings are rounded outwards, and the anal angle is not produced.

Beneath rich brown, with 4 or 5 dusky bars, the basal ones on hind wing macular. The fore-wing costa has a broad orange border, in which, at regular intervals from base to apex, are six rather large but irregular glittering plumbaginous patches. There is a submarginal row of black dots to both wings, and an ochreous outer border to hind wing.

Hab. Ega; settling on moist sandy margins of the lake, with wings extended.

CALYDNA ARGIELLA.

♂. 1" 3". Wings not angulated; fore-wing costa very slightly and broadly incurved in the middle; outer margin nearly straight; apical angle acute; outer margin of hind wing gently rounded; anal angle not prominent, obtuse; fringe dark brown spotted with white. Above darkish brown, with a large number of dusky spots and a submarginal row of the same encircled with paler brown.

Beneath lighter brown than above; black spots more distinct, oblong or rounded, each encircled by an ashy ring.

Eyes naked. Antennæ with a much elongated black club; shaft ringed with white.

Hab. Brazil.

CALYDNA TINEA.

♀. 10". Very small; differs from *C. euthria* and allies in the costa of the fore wing being regularly arched from base to apex; the latter is slightly produced and acute; the outer margin rounded outwards in both wings, and in the hind wing more advanced than the anal angle. Fringe alternately spotted with brown and whitish.

Above dark brown, varied with numerous quadrate dusky spots edged with pale brown. There is a row of more rounded spots near the outer margins, preceded by a line of pale-brown lunules.

Beneath not lighter than above, the spots more distinctly margined with pale brown; submarginal spots large, oval and black.

Eyes naked.

Hab. Pará.

CALYDNA MACULOSA.

♀. 1" 1". Wings rather broad, same shape as in *C. cabira*, ♀ (Hewits. Exot. Butt. *Calydna*, f. 6), but the apex of fore wing not so much produced, and hind wing not so angular. Above tawny

brown, with a large number of quadrate dark-brown spots, margined with tawny yellow, and also marked with numerous smaller, whitish spots, one within the cell of each wing, one under the origin of the first median branch, and a flexuous row of 7 or 8 extending across the wings beyond the cell. Fringe brown, spotted with lighter brown.

Beneath lighter, ochreous brown, with the nervures ochrey-yellow; spots same as above, but the submarginal row are alternately larger and darker.

Hab. St. Paulo, Upper Amazons.

CALYDNA MICRA.

♂. 1''. Near *C. euthria*, Dbldy. (Dbldy. & Hewits. Gen. D. L, pl. 70. f. 10), but quite distinct. Outer margins of the wings dentate, as in the majority of the species; the dentations fringed with black, the sinuses with white. Fore-wing costa incurved in the middle, sharply arched before the apex, the latter produced, acute.

Above dark sooty-brown, sprinkled irregularly with tawny atoms, and having numerous amorphous black spots and patches, besides a flexuous submarginal row of more regular black spots edged with reddish tawny; the wings are also marked with a few shining, narrow, white specks—one, more conspicuous, within the cell of each wing, and four or five, smaller, on the apical half of the costa of fore wing.

Beneath, the same, but paler, and with more pale atoms and distinct rufous rings.

♀ same shape and size as ♂, but paler, the upper- and undersides almost exactly resembling the underside of the opposite sex.

Hab. Dry forests of the Tapajos and Villa Nova, Amazons.

Genus BÆOTIS (Hübner).

A group of small species resembling the broader-winged species of *Mesene* (*M. Ærope*, &c.) in outline, and agreeing with *Charis* in the possession of a shining plumbaginous submarginal line on the wings. They differ from both genera in the palpi being more elongate, the slender tips being visible beyond the forehead when viewed from above. The neuration offers no peculiarity; but the colour-pattern of the wings is very similar in the four known species, and indicates a natural group. A marked feature is the broadly rounded hind wings, the outer border of which is much more advanced than the anal angle. The eyes are naked.

Papilio hisbon, Cramer, belongs to the genus. It is sometimes seen on flowers in thinned woods in "campo" districts, and elevates and depresses its wings, when settled, like the *Calydnæ*. The other species hold their wings extended, like the *Nymphidia*.

BÆOTIS EUPREPES.

♂. 1" 3". Same form as *B. hisbon* (Cramer, Pap. t. 83. f. C), rather larger, and differing from all the varieties of that species in the first ochreous belt being distant from the base of both wings. Colour above dark brown, crossed by three narrow yellow belts, each continuous and uniform, but the middle one rather broader than the others. A submarginal plumbaginous line; above the anal angle and near the costâ of hind wing are large spots of the same hue.

Beneath paler, the third yellow belt furcate near its termination at the hind angle of each wing; base of wings also yellow. Fringe dark brown, with three white places in each wing.

Hab. Forests of the Tapajos.

BÆOTIS PRIMA.

♂. 1" 7". A larger and more robust species. Above dark brown, wings with a narrow basal streak occupying the abdominal edge of hind wing, an oblique central belt, and a narrow subapical line, ochreous yellow, a plumbaginous submarginal line, and on the hind wing spots of the same hue near the anal angle and apex.

Beneath paler, with the addition of a fourth yellow belt near the base; the outermost belt of the hind wing is bifurcate at the anal angle.

♀. Paler than the ♂. Yellow belts broader and four in number on the fore wing by the addition of a short subbasal streak. Beneath, this additional belt is continued on the hind wing.

Hab. Banks of the Tapajos, and at Ega.

METACHARIS CUPARINA.

♂. Allied to *M. Nicaste* (Herr.-Schäff. Exot. Schmett. f. 47, 48), wings considerably broader. Above ruddy brown, with a rich violet gloss; black markings much less distinct, and obsolete on the outer halves of the wings; submarginal plumbaginous lineoles and spots the same.

Beneath tawny brown glossed with violet; submarginal black spots obsolete, except the apical one on each wing.

Hab. Banks of the river Cupari, Tapajos.

METACHARIS NIGRELLA.

♂. Also allied to *M. Nicaste*, and more closely to *M. regalis*, Butler (Entom. Month. Mag. iii. p. 174). Above dark brown, nearly black, faintly glossed with slaty blue; black marks indistinct.

Beneath rich glossy violet, without any distinct black marks or spots.

Hab. Banks of the Cupari, Tapajos.

METACHARIS (ECHENAIIS) EXIGUA.

♀. 10". Allied to *Echenais Chia*, Hübn. (Zutr. f. 357, 358), but apparently not its female, as the markings of the underside are very different. The wings are rounded, with obtuse apical angle to fore wing. Above brown, variegated throughout with subquadrate darker brown spots, and with a less number of orange-coloured spots of the

same size between them; a regular submarginal row of darker spots edged with tawny orange.

Beneath, the ground-colour is tawny yellow, with the black spots as above.

Hab. Forests of the Tapajos.

Genus LASAIA, nov. gen.

This new genus is founded on species having a close relation to the hairy-eyed sections both of *Charis* and *Calydna*, but differing from both in the slender tips of the palpi projecting beyond the forehead.

L. MERIS, Cramer; Pap. pl. 366. f. B, C. Tropical America.

L. CLEADAS. *Charis Cleadas*, *Hewits. Exot. Butt.* *Charis*, f. 10.

Hab. Dry woods of Santarem, on the Tapajos, Amazons.

THAROPS SUPERBA.

♂. 1" 10". A very robust species, closely allied to *Th. splendida*, Butler (*Journ. Linn. Soc.* vol. ix. p. 224). Differs in the fore wing being more obtuse at the apex, and in the hind wing being much more advanced and broadly rounded in the apical portion, thus rendering the outer margin less oblique thence to the apex. Above, it is of a metallic light green colour, with pure cerulean blue on the disk and costal part of hind wing; the costal and apical borders are broadly blackish-brown, and with the borders are blended the black marks of the wing-cell.

Beneath ochreous rusty, with the inner half of the fore wing and disk of hind wing whitish, marked with dusky or rustyspots.

Hab. Villa Nova, Amazons.

LEMONIAS MELIA.

♀. 1" 4". Resembles *L. cerealis*, Hewits. (*Exot. Butt. Lem.* f. 37), shape of wings the same. Above pale straw-colour, base of fore wing crossed by two rows of oblong blackish spots; and then follows a broad, clear, straw-coloured band; and the whole outer border is broadly black, with a slender line of straw-colour running through it, followed by two short streaks near the hind angle. The hind wing is crossed by seven broadish slightly waved black belts, of which the 3rd (from the base) is much abbreviated, and the 6th macular. Fringe alternately black and white.

Beneath, the same, except that the black belts of the hind wings are broken into spots.

LEMONIAS CAMPESTRIS.

♂ & ♀. 1" to 1" 4". Closely allied to *L. Epulus* (*Cram. t.* 50. f. C, D). Differs in the wings being of a light reddish-tawny hue and destitute

of pale spots. The base of the fore wings is crossed by oblong dusky spots, as in *L. Epulus*; and beyond the middle are two broadish, irregular, flexuous, dusky bands, followed by a clear reddish-tawny belt continuous from the costa to the hind margin, the outer margin being dusky brown. The hind wings are generally reddish tawny, without distinct black markings (although these are sometimes faintly apparent as macular belts), except the submarginal row of blackish spots.

This species was the prevalent form on the extensive natural "campos" of the Tapajos. *L. Epulus* is common in all waste, open grounds near towns, on the Amazons.

LEMONIAS PIONE.

♂. 1" 6". Slaty greenish, silky, shining, above and beneath. Fore wing triangular; costa incurved in the middle; apex acute, slightly produced, outer margin nearly straight. Hind wing gently rounded outwards. Both wings crossed above and beneath by a large number of short blackish streaks in the interspaces of the nervures, and having a submarginal row of black spots. Fringe blackish, except a white spot near the apex of the fore wing.

Head, body, and legs dark brown.

Hab. Pará. Bears some resemblance in form and markings to *L. ocyptore* (Geyer in Hübn. Zutr. f. 989, 990), which is probably an *Emesis*.

LEMONIAS GALENA.

♂ & ♀. 1" 9". Wings rather short and broad. Fore-wing costa nearly straight in the middle, arched just before the apex, the latter acute. Above dark reddish-ochreous; both wings with three short black streaks across the cell, two below the median nervure, and a flexuous line of similar streaks beyond the cell; outer border darker, reddish, with a faint row of whitish lunules running through it; outer margins black; fringe dark brown, with paler spots.

Beneath lighter tawny ochreous, passing to whitish over the basal portions. Basal spots of fore wing encircled with tawny white. Hind wing with a marginal row of dark rusty spots, darker near the anal angle, and surmounted by whitish lunules, a short row of similar spots towards the hind angle of fore wing.

Common throughout the Amazons. Also found at Cayenne.

LEMONIAS SIAKA, Hewits. Exot. Butt. Lemon. f. 10, 11.

♀. Size and shape of ♂ (fig. sup. cit.) except that the outer margins of the wings are more rounded. Above dark brown; both wings crossed by a tawny belt, beginning beyond the middle of the fore-wing costa, curving to near the hind angle, and prolonged as a submarginal stripe on the hind wing, where it assumes a deeper orange hue.

Beneath paler; belts as above; a few obscure blackish spots on the basal portions of the wings.

Hab. Ega, in company with the male.

LEMONIAS APOTHETA.

♂. 1" 3". Wings rather short and broad, as in *L. Galena*. Fore-wing costa nearly straight until before the apex, towards which it is curved; the apical angle distinct; outer margin very slightly rounded. Hind-wing outer margin broadly and subangularly rounded. Above darkish ochreous brown; wings crossed by a few short slender darker-brown streaks, outer border tinged with rufous and marked with a regular row of blackish spots edged with whitish.

Beneath greyish white, becoming brown on the apical half of fore wing; dark-brown spots and lineoles as above; the submarginal row of spots on the hind wing surrounded by slender brown circumflexes.

Hab. Brazil.

LEMONIAS HEMILEUCA.

♂. 1" 6". Allied to ♂ of *L. Aristus*, Stoll, and *L. Aminias* (Hewits. Exot. B. Lem. f. 29), but a more robust species, with prominent anal angle to the hind wing, like *L. Penthea*, Cramer. Fore-wing costa straight, except just before the apex, where it is curved, the apical angle being produced. Above ruddy brown, shining; the basal half of the fore wing crossed by seven black lineoles, which are not margined with paler colour; beyond the cell a patch of bluish grey enclosing a transverse series of shorter black lineoles; a submarginal row of grey circles enclosing spots of the ground-colour of the wing. Hind wing with the apical half white, with submarginal black spots. Basal half crossed by black lineoles, and beyond the cell by a streak of blue-grey in which is a flexuous row of black spots.

Hab. Pará. Apparently quite distinct from all the numerous varieties of *L. Aristus*.

LEMONIAS LAMPROS.

♂. 1" 1". A small, slender species, with somewhat elongated wings and the anal angles of the hind pair not more advanced than the tip of the abdomen. Fore wing dark purple-brown, with a few obscure blackish lineoles and a submarginal row of blackish spots; glossed with dark violet-blue; hind wing entirely glossy violet-blue.

Beneath pallid brown, with a number of dark-brown spots and lineoles; of these there are two spots in the cell of both wings, a slender lineole across the end of the cell, and two below the median nervure, a flexuous row of spots beyond the cell, and a dusky belt between them and the submarginal row.

Hab. Ega and St. Paulo, Upper Amazons.

NYMPHIDIUM OCHRA.

♂ & ♀. 1" 7". A very distinct species, allied to *N. Agle*, Dbldy. (Hewits.

Exot. Butt. Nymph. f. 3); shape of wings the same. Above clear dark brown without any admixture of rufous; the whole central area of both wings occupied by a large pale-ochreous patch, or broad belt, extending obliquely from the upper radial nervure of the fore wing, across the lower apical portion of the cell, to the abdominal edge of the hind wing; the ochreous area leaves a brown border rather narrower than that in *N. Agle*, and quite even on its edges, except within the fore-wing cell. Down the centre of the fore-wing outer border runs a pale-ochreous line, double as it approaches the hind angle; on the hind wing there is a chain of ochreous circles enclosing blackish spots. Fringe dark brown.

Beneath, the same as above, but paler, especially the brown borders.

Abdomen of the male yellow, except at base, where it is brown like the thorax; in the female it is brown above.

Hab. Ega and St. Paulo, Upper Amazons.

Nymphidium fulminans.

♂. 1" 9". Allied to *N. Lysimon*, Stoll (Suppl. Cram. pl. 39. f. 1); differs in the wings being free from red streaks, and in the marginal grey arched lines assuming very elongated acute-angular forms. Above dark brown, centre of both wings traversed by a very oblique white belt, which begins with the fringe in the middle of the fore-wing outer border, passes at a distance from the cell, and gradually widens to the abdominal edge of hind wing. In the fore-wing cell, and below the median nervure, are the usual grey lines forming parallelogramical figures; and there is a row of shorter marks between the cell and the apex, and along the upper edge of the white belt. The marginal arched lines do not differ on the fore wing from those of *N. Lysimon*; on the hind wing they are so much elongated as to form acute-angular figures, the third from the anal angle being much longer than the others.

Beneath, the same, but paler, the brown margins mixed with grey. Fringe of hind wings above dark brown. Abdomen white in the middle.

♀. Same colours and markings as the ♂, but wings elongated and similar in shape to those of *N. Mantus*, Cram. (Pap. t. 47. f. F, G); the white on hind wing narrow, similar to that of *N. Mantus*.

Hab. Banks of the Tapajos and at Villa Nova (Villa Bella), Amazons.

Nymphidium chimborazium.

♂. Closely allied to *N. Lysimon*, Stoll (Suppl. Cram. pl. 39. f. 1); differs in the hind wing, only, having near the anal angle a short red stripe. Above dark brown; fore wing with a triangular white spot, its apex on the middle of the terminal branch of the median nervure; hind wing with a broad white belt across the disk. The usual pale figures in the cell of the fore wing are of broadish oblong shape; the marginal semicircles on both wings are similar to those of *N. Lysi-*

mon, but they are less arched on the hind wing. The red belt within the brown margin of the hind wing ends abruptly at the median nervure, and it also differs from that of *N. Lysimon* in being indented by three black lunules which surmount the marginal semicircles. It occupies nearly the whole width of the brown border.

Hab. Valleys west of Chimborazo, alt. 3000 ft. (*Dr. Spruce*).

Nymphidium rubigo.

♂. 1" 6". Same form of wings as *N. Pelops* (Cram. t. 170. f. F). Fore-wing costa incurved in the middle, and arched before the apex. Above light rusty brown, with a large triangular spot on fore wing, and whole central area of hind wing pure white. The rusty-coloured borders thus left are of moderate width, as in *N. Pelops*; the usual spots in the cell are also rusty reddish and obscure; the marginal slender curved marks are whitish and form small semicircles. Beneath, the same, but paler. Head and thorax above rusty brown, rest of body white. Antennæ rusty brown, with ashy-white rings.

Hab. Banks of the Tapajos.

Nymphidium mesoleucum.

♀. 1" 7". Closely allied to *N. Calyce*, Felder (Wien. entom. Monats. 1862, p. 72); differs in the borders of the wings being dark brown, destitute of bluish grey on the margins, and in the fore wing having a submarginal whitish streak extending to the costa. Above dark brown, with the usual dark spots ringed with grey near the base of fore wing. Central portion of the wings occupied by a broad belt of pure white, commencing at the fore-wing subcostal, crossing the lower corner of the cell, and extending to the abdominal margin of the hind wing. The dark-brown outer borders have not a distinct rufous streak as in *N. Calyce*, *Molpe*, and allied species; and the marginal row of black spots is distinct and uniform, edged on the inner and outer sides with whitish; on the fore-wing the spots are encircled with whitish, and a white streak extends from them to the costa.

Beneath, the same, but much paler, and marginal spots of hind wing irregular both in size and colour.

Hab. Barauquilla, New Granada.

Nymphidium eutrapeia.

♂ & ♀. 1" 7". Closely allied to *N. Ninias*, Hewits. (Exot. Butt. Nymph. f. 22); differs in the fore wing having a broadish dark-brown costal border. The wings, especially in the ♀, have the same broad obtuse outline as in *N. Ninias*. Above dark brown, nearly black; central area of fore wing and the whole of the hind wing, except the outer border, pure white. The edge of the costal border of the fore wing is marked, inside the cell, with several fine transverse streaks; and the much broader outer border has two rather deep indentations. It has near the hind angle of both wings a narrow streak of red; but this is sometimes wanting. The marginal row of slender grey curved lines form a series of semicircles.

Beneath, the same, except that the outer border of fore wing has three, and of the hind wing two white patches.

The fringe is blackish, with three white places on the fore, and two on the hind wing. The abdomen is wholly white in both sexes.

Found at various places on the Amazons—Pará, Ega, and Tunantins. It seems intermediate between *N. Chione* (Bates), and *N. Ninias*.

NYMPHIDIUM HELIOTIS.

♀. 1" 6". Wings broadly rounded. Above pale ochreous yellow, with a slight tawny tinge; base of both wings dark brown, which colour extends along the edge of the costa; outer borders dark brown, broad near the fore-wing apex, rather narrow and uniform on the hind wing. The marginal row of pale lines form a series of curves from the apex of fore wing to the anal angle of hind wing.

Allied to *N. Cachrys*, F. (*Damon*, Stoll, Suppl. Cram. pl. 39. f. 5) and *N. Ascolia*, Hewits. (Exot. B. Nymph. f. 4), but distinct.

Hab. Ega.

Genus EUERYCINA, Saunders, Trans. Ent. Soc. vol. v. 2nd ser. p. 97.

This genus was simply indicated by Mr. W. W. Saunders (*loc. cit.*) as a section of the genus *Erycina*, without characters. It is distinguished from the true *Erycinæ* by the second branch of the fore-wing subcostal being emitted before the end of the cell, as in the group of genera allied to *Nymphidium*. The palpi project beyond the forehead; and the antennæ are partially ringed or spotted with paler colour, besides being rather more slender than in *Erycina* and *Diorhina*. These characters show that its place is near *Lemonias*; and the style of coloration points to an affinity with *L. Irene*, *siaka*, and allies, notwithstanding that the hind wing is produced into a long tail.

EUERYCINA CALPHARNIA, Saunders, Tr. Ent. Soc. v. 2nd ser. pl. 20. f. 7.

Hab. Upper Amazons.

The flight is exceedingly rapid; and it settles on the under surface of leaves with its wings expanded.

ARICORIS GELASINE.

♂. In size and form agreeing with *A. Lagus* (Cramer, t. 117. f. F, G).

Above of a more violaceous and darker hue, with a whitish discal spot traversed by the first median branch. Beneath also very similar to *A. Lagus*, differing chiefly in the base of the costa of hind wing having a saffron-yellow spot extending to the costal nervure.

♀? Resembles *A. Myrtis*, Doubldy. (Westw. in D. & Hew. Gen. D. L. p. 450). Dark blackish brown, with a large spot near the base of fore wing (including the hind margin) and a short broad fascia in the

apical portion ochreous yellow; the whole basal area of hind wing also ochreous yellow, leaving only a moderately broad dark outer border. Beneath, the yellow colour is of the same hue; but the brown portions are much lighter and of a silky glossiness. The outer border of the hind wing has a row of six or seven semicircular white spots.

Both sexes, as above described, occurred at Ega, Upper Amazons, where neither *A. Pythia*, Hewits., nor *A. Myrtis*, Doubldy., was found. The two latter inhabit together the banks of the Tapajos and Lower Amazons; and I think I am not wrong in considering them sexes of one species.

ARICORIS VELUTINA.

♀. Same form and size as *A. Epitus* ♀ (Cram. t. 270. f. C); differs totally in colour. Dark brown, with a violaceous gloss, paler towards the outer margins. Fore wing crossed by an oblique broadish orange-yellow belt, extending from the costa to the outer margin near the hind angle.

Beneath brown, nervures paler; outer border of hind wing very pale brown, nearly white, except the brown nervures; orange belt of fore wing lighter in colour.

♂. The male is a fine insect, with elongated hind wings, like *A. Epitus* ♂ (*Cataleuca*, Herr.-Schäff. Exot. Schmett. f. 28, 29). Above, it is black, with the whole central area and hind limb of the fore wing, and outer border of hind wing, rich glossy dark blue. Beneath, it is dark brown, with much darker nervures and paler outer border; a basal streak in the fore wing and costal spot beyond the end of the cell are also light brown.

I found the species only at St. Paulo, Upper Amazons.

ARICORIS DISPARILIS.

♂. 1" 4''''. Similar in form to *A. Lagus*; above dark brown, with the discal areas of the wings glossy violet-blue; fore wing with a large oval white spot in the centre.

Beneath, differs from all the allied species hitherto described, in the base of the hind wing having a large irregular orange-coloured spot covering the basal portions of all the nervures. The fore wing is brown, nervures concolorous, with two whitish streaks at the base, and the large central white spot as above. The hind wing is violet-brown, nervures darker, with a whitish streak in the cell, and elongated sub-marginal whitish spots between the nervures.

♀ 1" 3''''. Similar in shape to *A. Myrtis*. Above dark brown, with the basal third of fore wing (except the costa) and basal half of hind wing orange. The orange-coloured portion of the hind wing is deeply indented by the black border near the costa, and its hind margin is festooned. The fore wing has in the middle of the black apical portion a short white belt.

Beneath, the same, except that the brown outer border of the hind wing has a series of five triangular whitish spots.

Hab. Forests of Cuparí, Tapajos.

ARICORIS FLAMMULA.

♂. 2". Fore wing triangular; hind wing with the anal portion broadly produced and its margin tridentate. Above, purple-black, with a broad streak in the middle of the hind border of the fore wing, and the whole discal area of the hind wing, rich scarlet; a white belt crosses the apical portion of the fore wing; the abdominal border of the hind wing is tawny yellow.

Beneath pale brown; a streak at base of costa of fore wing tawny white; belt white. Hind wing with the abdominal border broadly rufous tawny; disk whitish; outer border darkish brown, with a sub-marginal yellow streak, broad at the anal angle and terminating before reaching the apex; margins edged with white; fringe blackish.

♀. 2" 2". Similar in colours to *A. Epitus*; fore-wing apex produced, and outer border much less rounded. Hind-wing outer border not produced near the anal angle, but tridentate, as in the ♂. Above dark brown, basal portions of both wings tawny orange; fore wing crossed a little beyond the middle by a broadish yellow belt. Hind wing with a row of three yellowish spots towards the outer margins.

Beneath tawny; brown portions of a tawny-brown hue; outer border of hind wing with a broadish yellow belt, and margin white as in the ♂.

Wings vertical in repose, as in the rest of the genus.

Hab. Banks of the Tapajos, and at Ega.

THEOPE SERICEA.

♂ & ♀. 1" 6"; 1" 8". Shape of wings as in *Th. pedias* (Herr.-Schäff. Exot. Schmett. f. 24, 25); larger and stouter, black, a large area of the fore wing, occupying the disk and middle of hind margin, and whole of hind wing (except the margins, costal borders, and sometimes a discal spot), dark blue, slightly shining.

Beneath, in the ♂, rich golden-yellow, with a silky gloss; in the ♀, paler yellow, but glossy.

The blue area of the fore wing leaves a very broad costal and apical black border, but a very narrow outer border towards the hind angle.

In the ♀ the blue is more contracted in its limits.

Hab. Pará and Tapajos.

THEOPE LAMPROPTERYX.

♂. 1" 6". Same form as *T. pedias* (*i. e.* hind-wing outer border nearly in a line with the apex of abdomen). Above, fore wing black; a small spot at the base, and the whole of the hind wing, except the margins, rich glossy dark blue.

Beneath ochreous yellow, moderately shining.

Hab. Santarem, Lower Amazons.

THEOPE HYPOXANTHE.

♂. 1" 6". Closely allied to *Th. pedias*, Herr.-Schäff. (Exot. Schm. f. 24, 25). Fore-wing costa more strongly arched near the base, nearly straight from beyond the middle to the apex; the latter rectangular, with the outer border rounded only from the middle to the hind angle. Hind-wing outer border nearly in a line with the apex of abdomen. Above black, with fore-wing costa and the fringes lightish brown; a large spot, occupying more than the basal half of the fore wing (except a broad costal border) and the whole of the hind wing (except a narrowish outer border), glossy blue.

Beneath yellow, without gloss.

♀. Same form as the ♂. Blue colour less glossy, and contracted in area on the hind wing by a broad costal black border, and on the fore wing by the costal border becoming suddenly wider at the end of the cell.

Beneath yellow, without gloss, as in the ♂.

Hab. Pará.

THEOPE SOBRINA.

♀. 1" 5". Closely allied to *Th. Thootes* (Hewits. Exot. Butt. *Theope*, f. 9, 10); the fore-wing costa very abruptly arched from the base. Basal half of the fore wing and the whole of hind wing, except the costal borders and outer margins, glossy blue, more violaceous than in *Th. Thootes*; the blue area of fore wing deeply bisinuated, as in *Th. Thootes*.

Beneath, differs from *Th. Thootes* in being of a brownish golden tawny hue, glossy. In *Th. Thootes* the ♀ is of the same brown colour beneath as the ♂.

Hab. Forests of the Tapajós, Amazons.

THEOPE APHELES.

♂ & ♀. 1" 3". Also closely allied to *Th. Thootes*, Hewits.; smaller, but wings of the same shape; the fore-wing costa very strongly arched at the base, and slightly arched near the apex, which is a little produced in both sexes. Colour lighter blue; the blue area of fore wing bisinuate, as in *Th. Thootes*, and of the same extent.

Beneath very light brown.

Hab. Upper Amazons.

THEOPE ZOSTERA.

♀. 1" 5". Very similar to *Th. Thootes* in shape and colours above, but the blue of the fore wing is of greater extent, leaving only a broad apical border deeply indented in the middle.

Beneath tawny-yellow, with an obscure brownish belt across the disk of both wings beyond the middle.

Hab. St. Paulo, Upper Amazons.

THEOPE AUREONITENS.

♂. 1" 2". Fore-wing costa gently curved, apex obtuse; outer margins

of both wings regularly rounded. Above glossy blue, with a costal and outer brown border to the fore wing only, of small width; apical half of the disk with a large round opaque light-brown spot.

Beneath, lustrous golden-yellow.

♀. 1" 2". Wings of the same rounded outlines as in the ♂; above dullish brown, spotless; beneath straw-yellow without gloss.

Hab. Ega, Amazons.

THEOPE HYPOLEUCA.

♂ & ♀. 1" 2". Fore-wing costa arched near the base, thence very gently curved to the apex, apical angle subobtuse, outer margin very gently rounded. Above blue (similar to *Lycæna alexis*); fore wing with a narrowish costal border, and very broad outer border, black; hind wing very narrowly edged with blackish.

Beneath very light-brown, nearly white.

Hab. Santarem, Amazons.

THEOPE EXCELSA.

♂. 1" 10". A large robust species. Fore-wing costa very slightly arched near the base and apex, in the middle straight; outer margin gently curved outwards; hind wing lengthened in its anal portion; outer margin nearly straight from anal angle to the apex.

Above dark blue, slightly glossy, nervures blackish; fore wing with a broadish costal and outer border, hind wing with a costal border, black.

Beneath deep rich yellow, slightly glossy.

Hab. Ega.

THEOPE AZUREA.

♂. 1"—1" 3". Fore wing triangular, with costal and outer margins nearly straight, and apex acute. Hind-wing outer margins gently rounded. Above fine glossy blue; costa of fore wing with a narrowish, outer margin with a broad dark-brown border, very broad at the apex. Hind wing very narrowly edged with dark brown. Fringe pale brown.

Beneath light tawny-brown, spotless.

Hab. Ega and Fonte Boa, Upper Amazons.

THEOPE SIMPLICIA.

♂ & ♀. 1". Fore wing triangular; costa slightly arched near the base and apex, apical angle distinct, outer margin nearly straight; hind wing subtriangular. Above, fore wing brown, spotless; hind wing lilacine blue, costal border narrowly brown. Hind wing in ♀ with basal portion above brown.

Beneath very light brown, nearly white, spotless.

Hab. Pará, common.

THEOPE LYCÆNINA.

♂ & ♀ 1"—1" 3". Fore wing triangular; costa gently arched, apex

obtuse, outer margin of both wings slightly rounded. Above black, with discal area of both wings dark blue, scarcely shining, leaving blackish borders very indistinctly limited from the blue.

Beneath very light brown, nearly white; hind wing with a submarginal row of dusky spots, distinct only towards the anal angle.

Fringe light brown.

Hab. Pará and Santarem, Lower Amazons.

THEOPE FOLIORUM.

♂. 1" 2"—1" 4". Fore wing triangular; costa arched near the base, then straight until just before the apex, where it curves down to the acute apical angle; outer margin straight; outer margin of the hind wing gently rounded. Above, fore wing black; with a discal spot, touching the hind margin and embracing about one-third of the surface, dull blue, sometimes obscure with blackish scales. Hind wing light blue, with ill-defined costal and apical brown border, outer edge dark brown, with a submarginal row of black spots edged with whitish. Fringe pale brown or white.

Beneath very light brown, nearly white. Hind wing with a row of black spots towards the anal angle.

♀. Fore wing much less acute at the apex, and outer margins rounded. Hind wing broadly rounded, as much advanced as the anal angle. Above brown, with the blue patch and marginal black spots of the hind wing as in the ♂. Beneath, the same as in the ♂, except that the black spots of hind wing form a continuous row from anal angle to apex.

Hab. Pará and Santarem, Lower Amazons; a common insect.

THEOPE PUNCTIPENNIS.

♂ & ♀. 1" 3". Fore wing triangular; costa slightly arched, apical angle subobtuse; outer margins gently curved outwards, less so in the ♂ than in the ♀. Above dark brown, a patch of light greyish blue on the inner portion of the fore wing near the base in the ♂, very indistinct in the ♀. Hind wing in the ♂ greyish blue, outer edge brown; in the ♀ brown, tinged with blue towards the base; a submarginal row of blackish dots in both sexes. Fringe light brown, nearly white.

Beneath very light brown, sometimes nearly white; a submarginal row of blackish dots in both wings.

Hab. Tapajos and Ega, Upper Amazons.

Differs from *Th. foliorum* only in the lighter shade of blue and the row of submarginal spots beneath in both wings.

THEOPE ATIMA.

♂. 1" 3". Fore wing triangular, costa slightly arched, nearly straight in the middle, apical angle distinct. Above black. Fore wing with the cell and several longitudinal streaks blue; hind wing with the

discal and inner portions blue, traversed by black nervures; a submarginal row of black dots. Fringe dark brown.

Beneath brown, hind wing with a submarginal row of black dots.

Hab. Ega.

Differs from *Th. foliorum* in the streaks of blue of fore wing above, and in the much darker hue of the under surface.

THEOPE LEUCANTHE.

♂ & ♀. 1". A small delicate species; costa of fore wing slightly arched towards the base, scarcely arched near the apex; outer margin of hind wing regularly rounded in both sexes. Above, fore wing brown, spotless. Hind wing light greyish blue, the base in the ♂ and a broad costal border in the ♀ brown; outer margin narrowly edged with brown, and with a submarginal row of dusky specks encircled with paler grey. Beneath ashy white; a submarginal row of black specks surrounded by purer white on both wings.

Hab. Pará and Santarem, Rio Tapajos.

THEOPE TETRASTIGMA.

♂ & ♀. 1" 2". A slender species with elongated fore wings. The fore-wing costa is slightly arched near the base and apex, the latter distinctly produced; the outer margin bowed outwards towards the hind angle, very strongly so in the ♀. Hind wing small, subtriangular. Above dark brown, spotless; fringe concolorous. Beneath darkish brown, with a short pale streak across the end of the cells of both wings, and a submarginal row, in both wings, of black spots encircled by pale brown.

Hab. Forests of the Cuparí and R. Tapajos, Amazons.

THEOPE METHEMONA.

♂. 1" 6". Fore wing triangular, costa arched towards the base and apex, straight in the middle; outer margins nearly straight. Above black, with the disk and base of both wings occupied by a large, common, shining blue patch, leaving somewhat regular and broad black borders. Fringe dark brown.

Beneath very light brown, with a submarginal row of small black specks on both wings.

Hab. Santarem, Amazons.

THEOPE CÆRULEA.

♀. 1" 6". Closely allied to *Th. Virgilius*, Fab. (E. S. iii. 1. 323. 226), which is found in Honduras and Nicaragua. Fore-wing costa strongly arched near the base, incurved in the middle and gently arched at a distance before the apex. Above dark brown, basal half of fore wing and whole of hind wing, except the brown apical portion, light cærulean blue; the brown apical portion of fore wing has also in the middle a blue spot. The hind wing has a submarginal row of dusky longitudinal lineoles, and the nervures are dark in colour. Fringe dark brown.

Beneath rufous tawny; hind wing with a row of three black spots near the anal angle, surmounted by white circumflexes.

Hab. South Brazil.

THEOPE SYNGENES.

♀. 1" 6^{'''}. Allied to *Th. Lytea*, Hübn. Costa of fore wing strongly arched near the base, incurved in the middle, and very slightly arched again before the apex, the latter distinctly produced; outer margin rounded outwards towards the hind angle. Above brown, a basal patch on fore wing and a spot near the costa towards the apex blue; hind wing with an irregular broad blue streak from the base to the outer border; the nervures are brown, and between them is a submarginal row of elongated triangular blackish spots.

Beneath rich tawny yellow, with a square rusty patch at apex of fore wing, and an obscure rusty-brown belt extending from it across the wings to the middle of the abdominal margin. The hind wing has a black spot surmounted by a white one near the anal angle, and a row of rusty-red spots in a line with it to the apex.

The subapical blue spot of fore wings is sometimes wanting.

Hab. Pará and Santarem, Amazons.

THEOPE DREPANA.

♂ & ♀. 1". A small delicate species with strongly arched costa and falcate apex of fore wings—the falcation existing only in the ♂, the apex being simply acute in the ♀. The outer margin of the fore and hind wings is strongly bowed outwards, and in the hind wing is obtusely dentated and incurved towards the anal angle.

Above blue, with a broadish outer border and two very irregular flexuous lines of short lineoles across the disk blackish-brown; outer edge of wing and a submarginal row of specks (more distinct in the ♀) blackish. Fringe varied with lighter and darker brown.

Beneath pallid, minutely irrorated with rusty yellow, and varied with short, transverse, rusty-yellow lineoles, some of which unite beyond the middle to form a flexuous belt across both wings. Near the apex of the fore wing is a whitish patch, and there is a submarginal row of black specks surmounted by rusty-yellow circumflexes in both wings; a narrow edging of ferruginous to the outer borders.

Hab. Egä.

THEOPE DISCUS.

♂. 1" 3^{'''}. Fore-wing costa and outer border nearly straight, apex acute; outer border of hind wing rounded outwards; thorax oval, robust, antennæ more abruptly clubbed than in the typical species.

Above black, both wings with a basal spot occupying about one-third of the area of the wing glossy dark blue.

Beneath dark brown; basal part of costa of fore wing with a dark-brown streak (sometimes tinged with yellow); this is followed by a broad oblique basal belt of pale lilacine.

Hab. Pará and Upper Amazons.

The more abruptly formed antennal club, is not accompanied by any difference in palpi, neurulation, or habits such as to warrant the separation of this species from the genus *Theope*. Like all the other species of *Theope* and *Aricoris*, the wings are held vertical in repose. It is closely allied to *Theope Janus* (Bates, Trans. Ent. Soc. vol. v. 3rd ser. p. 546).

THEOPE EURYGONINA.

♂. 1" 4". Fore-wing costa very slightly arched near the base, incurved in the middle and more strongly arched before the apex, the latter subacute; outer margin nearly straight. Hind wing prolonged in its anal portion. Antennal club distinct, elongated.

Above, fore wing brown, with a triangular patch of light blue at the base.

Hind wing glossy light blue, costal border brown.

Beneath light brown, wings crossed by three darker, rusty-brown belts and having a submarginal row of dark-brown specks (close to the third belt) encircled with light brown; a fine brown lineole crosses the end of the fore-wing cell.

♀. 1" 4". Fore-wing costa similar in direction to that of the ♂, apex more obtuse, and outer margin bowed outwards. Hind wing not at all prolonged in its anal portion, outer margin subangularly bowed outwards. Above similar in colour to the ♂, but the hind wing has a submarginal row of large dusky triangular spots. Beneath, the same as in the ♂.

Hab. Santarem, Amazons.

THEOPE NOBILIS.

♂. 1" 9". Fore wing triangular, costa very slightly arched near the base, then straight to near the apex, the latter acute, outer margin straight. Hind wing subtriangular, with advanced anal portion. Antennæ with distinct elongated club.

Above blackish brown; basal half of fore wing and whole of hind wing, except the broad costal border, fine dark blue; the blue of fore wing is bounded by the subcostal nervure, and its outer edge crosses the origin of the second median branch and extends to the outer margin of the wing. Beneath yellow; hind wing with three or four black spots, surmounted by white circumflexes, near the anal angle.

♀. 1" 9". Fore-wing costa strongly arched near the base, incurved in the middle, and scarcely at all arched again before the apex; outer margins of the hind wing rounded outwards and as much advanced as the anal angle. Above dark brown, fore wing with a basal patch and a twin spot beyond the end of the cell blue. Hind wing with the inner half blue, nervures dusky, and a submarginal row of thick longitudinal lineoles black.

Beneath rusty tawny; near the anal angle a row of four black spots surmounted by white lineoles, as in the ♂.

Hab. Pará, and R. Tapajos.

CATAGRAMMINA, nov. gen.

Wings large and broad in the ♂, similar in size, form, and colours to the genus *Catagramma*, Fam. Nymphalidæ; in the female resembling the genus *Aricoris*. Neuration as in the genera of the *Nymphidium* group, the second branch of the fore-wing subcostal nervure being emitted before the end of the cell. Palpi very slender, the apical joint projecting beyond the forehead in the ♂, the apical and part of the penultimate joint also visible from above in the ♀. Antennæ moderate, club distinct, gradually formed; shaft unicolorous in the ♂, sparingly spotted with pale colour beneath towards the base in the ♀. Head and palpi clothed with smooth compact scales. Fore legs in the ♂ densely clothed with silky hairs; second and third pairs of legs destitute of hairs, moderately elongated; tarsi without spines beneath in the ♂, spined in the ♀.

CATAGRAMMINA TAPAJA.

Necyria Tapaja, Saunders, Trans. Ent. Soc. v. 2nd ser. p. 108, pl. xi. f. 17, 18, ♂.

♀. Fore wing more elongated than in the ♂, outer margin rounded outwards. Above black or dark brown; basal half of fore wing carmine-red or orange-yellow, with a black patch, near the middle of the hind border, separated into two by the postmedian nervure, and sometimes extending to the base of the wing. In the black apical half of the wing there is a short belt of red or orange-yellow, its lower end connected with a submarginal row of white spots. Hind wing black or brown, with a submarginal row of white spots. Wing-lappets orange-yellow.

Beneath the same, but paler, and the hind wing having a patch of orange-yellow at the base.

Hab. Tapajos and Ega.

URANEIS, nov. gen.

Body robust. Fore wing elongate triangular, with the costa straight from the base to near the apex, where it arches downwards; apical angle distinct. Hind wing produced into a broad short lobe at the anal angle. Fore-wing subcostal nervure three-branched, emitting its first and second branches before the end of the cell, and its third much nearer to the apex than to the end of the cell. Discocellular nervules joining the median at its terminal fork, in both wings. Antennæ grey, long, three-fourths the length of the fore-wing costa; club gradually formed and of moderate thickness. Palpi projecting considerably beyond the forehead, but much longer in the ♀ than in the ♂, as in *Nymphidium*, *Aricoris*, &c., smoothly scaled, like the head,

which is destitute of hairs or long hair scales. Wings semi-transparent, with black borders and nervures.

The wings in the ♀ are much more elongated than in the ♂. It is this character, together with the elongated palpi in the same sex, which induces me to separate the species on which the genus is founded from the genus *Tharops*, to which it is otherwise nearly allied.

The species, *U. hyalina*, Butler, is found only in the Amazons region, and has a very strong, rapid flight, settling on the under surface of leaves with the wings expanded.

Family ERYCINIDÆ.

Subfamily 1. NEMEOBIINÆ.

Four branches to the fore-wing subcostal nervure.

a. *Old-World species.*

Genus NEMEOBIUS.

Nemeobius, Steph. Ill. Br. Ent.; Westw. in D. W. & H. Gen. D. Lep. p. 419.

1. N. LUCINA, L. S. N. ii. 784, 203; Hübn. Schm. Eur. Pap. f. 20, 21.
Hab. Europe.

Genus DODONA.

Dodona, Hewits. Exot. Butt. (Jan. 1861).

1. D. DURGA, Kollar, Hügel's Reise, vol. iv. p. 441, t. 13. f. 3, 4.
Hab. Simla.
2. D. EGEON (Bdv.), D. W. & H. Gen. D. L. t. 69. f. 2.
Hab. Nepaul.
3. D. ADONIRA, Hewits. Exot. Butt. Dod. f. 1, 2, ♂.
Hab. Darjeeling.
4. D. DIPCEA, Hewits. Exot. Butt. Dod. f. 3, ♂.
Hab. Darjeeling.
5. D. OUIDA, Hewits. Exot. Butt. Dod. f. 4, 5, 6, ♂ ♀.
Hab. Darjeeling.
6. D. EUGENES, n. s., *suprà*, p. 371.
Hab. Bhotan, Nepaul.

Genus ZEMEROS.

Zemerós (Bdv.), Westw. in D. W. & H. Gen. D. L. p. 418.

1. Z. FLEGYAS, Cram. pl. 280. f. E, F (1782); D. W. & H. Gen. D. L. pl. 69. f. 5.

Z. Allica, Fab. E. S. iii. l. 244-761 (1793).

Hab. Malacca, China, Java, Assam, India, Borneo.

2. Z. EMESIOIDES, Felder, Wien. ent. Monats. 1860, p. 396; Reise der Novara, Zool. ii. 2. p. 289, pl. xxxvi. f. 9, 10, 11, ♂ ♀.

Hab. Malacca, Sumatra Borneo.

Genus ABISARA.

Abisara, Feld. Wien. ent. Monats. Decem. 1860.

Sospita, Hewits. Exot. Butt. (Jan. 1861).

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1. A. FYLLA (Bdv.), D. W. & H. Gen. D. L. pl. 69. f. 3.

Hab. North India.

2. A. SEGECIA, Hewits. Exot. Butt. Sos. f. 4, 5, 6, ♂ ♀.

Hab. Aru, Mysol.

3. A. WALLACEI, Hewits. Exot. Butt. Sos. f. 7, 8, ♂.

Hab. Mysol.

4. A. STATIRA, Hewits. Exot. Butt. Sos. f. 9, 10, 11, 12, ♂ ♀; Hewits. Linn. Journal, Zool. viii. p. 148, var., ♀.

Hab. Mysol, Waigiou, Salvatty.

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5. A. ECHERIUS, Stoll, Suppl. Cram. pl. 31. f. 1. 1, A. B. (1791).

Coriolanus, Fab. E. S. iii. l. 284. 91 (1793).

Hab. China, India, Philippines, Celebes.

6. A. KAUSAMBI, Feld. Wien. ent. Monats. Dec. 1860, p. 397.

Hab. Malacca.

7. A. LYDDA, Hewits. Exot. Butt. Sos. f. 13.

Hab. Hongkong.

8. A. SUSA, Hewits. Exot. Butt. Sos. f. 2, ♂ (Jan. 1861).

A. Savitri, Feld. Wien. ent. Monats. Decem. 1860, p. 397, ♂ ♀.

Hab. Malacca, Sumatra, Singapore.

9. A. NEOPHRON (Bdv.), Hewits. Exot. Butt. Sos. f. 3.

Hab. Sylhet.

10. A. ТЕРАНИ, Bdv. Lép. de Madagascar, pl. 3. f. 4.

Hab. Madagascar.

11. A. GERONTES, Fab. Sp. Ins. ii. 117 (1781).

Baucis, Drury, Ill. iii. pl. 12. f. 3, 4, App. (1783).

Hab. Sierra Leone.

12. A. TANTALUS (Bdv.), Hewits. Exot. Butt. f. 1, ♀; ib. f. 14, 15, ♂.

Hab. Ashanti, Old Calabar.

Genus TAXILA.

- Taxila* (Dbldy.), Westw. in D. W. & H. Gen. D. L. p. 421 (part.);
Hewits. Exot. Butt. Jan. 1861.
Dicallaneura, Butler, Proc. Zool. Soc. 1867, p. 37 (part.).
1. T. THUISTO, Hewits. Exot. Butt. Tax. f. 5, 6.
Hab. Singapore, Sumatra.
 2. T. PULCHRA, Guérin, Voy. Coquille, pl. 16. f. 2, 3, ♀.
Argynnis, id.
Emesis Leosida, Bdv. Voy. Astrolabe, Ins. i. p. 65.
Dicallaneura pulchra, Butler, Proc. Zool. Soc. 1867, p. 38.
Hab. Waigiou.
 3. T. DECORATA, Hewits. Exot. Butt. Tax. f. 11, 12, 13, ♂ ♀.
Dicallaneura decorata, Butler, Proc. Zool. Soc. 1867, p. 38.
Hab. Aru Islands, New Guinea, Mysol.
 4. T. DRUPADI, Horsfield, Cat. E. I. Co. pl. 2. f. 3, ♀ (1828).
Emesis Drupadi, Bdv. Sp. Gen. pl. 7. f. 2.
Hab. Java, Borneo, Malacca, Sumatra.
 5. T. ORPHNA, Bdv. Sp. Gén. pl. 21. f. 4, ♂; Hewits. Exot. Butt. Tax. f. 7, ♂; Hewits. Linn. Journ. Zool. viii. p. 149, ♀.
Hab. Borneo, Sumatra, Singapore.
 6. T. TANITA, Hewits. Exot. Butt. Taxila, text.
Orphna, D. W. & H. Gen. D. L. pl. 69. f. 6, 7. ? two species (nec Bdv.).
Hab. Borneo, India.
 7. T. DAMAJANTI, Feld. Wien. ent. Monats. Dec. 1860, n. 13.
Hab. Malacca.
 8. T. TELESIA, Hewits. Exot. Butt. Tax. f. 1, 2, ♂; Linn. Journal, Zool. viii. p. 149, ♀.
Hab. Sarawak, Sumatra.
 9. T. TENETA, Hewits. Exot. Butt. Tax. f. 3, 4.
Hab. Sarawak.

b. *New-World species.*

Genus ALESA.

- Alesa* (Dbld.), Westw. in D. W. & H. Gen. D. L. p. 417.
1. A. PREMA, Godt. Enc. Méth. ix. 569. 27; D. W. & H. Gen. D. L. pl. 70. f. 8, ♂.
Smaragdifera, Westw. in D. W. & H. p. 418, ♀.
Hab. Brazil, Amazons.
 2. A. TELEPHAE, Bdv. Sp. Gén. pl. 20. f. 2, ♂.

Eurybia Telephææ, Westw. in D. W. & H. p. 417.

♀, *suprà*, p. 372.

Hab. Cayenne, Amazons.

3. A. AMESIS, Cram. pl. 104. f. F, ♀.

Priolas, Godt. Enc. M. ix. 569. 26, ♂.

Amesis, H.-Schäff. Exot. Schm. f. 45, 46, ♂.

Hab. Cayenne, Amazons.

4. A. LIPARA, n. s., *suprà*, p. 371.

Hab. Tapajos, Amazons.

5. A. THELYDRIAS, n. s., *suprà*, p. 371.

Hab. River Cupari, Amazons.

6. A. HEMIURGA, n. s., *suprà*, p. 372.

Hab. Upper Amazons.

Genus EURYBIA.

(Illiger) Hübn. Verz. p. 17; Godt. Enc. M. p. 458.

1. EU. CAROLINA, Godt. Enc. M. 459. 1; Guér. Icon. R. A. Ins. pl. 80. f. 4; Voy. Coquille, Zool. p. 282, Ins. pl. 14 bis. f. 2.

Hab. South Brazil.

2. EU. PERGÆA, Hübn. Zutr. f. 747, 748.

Emesis Pergæa, Westw. in D. W. & H. p. 447.

Hab. South Brazil.

3. EU. SALOME, Cram. pl. 12. f. G, H (1775).

Nicaus, Fab. Syst. Ent. p. 482. n. 175 (1775), descr. very imperfect.

Var. *Dardus*, Fab. E. S. iii. 1. p. 482. n. 156 (1793).

Hab. Guiana, Amazons.

4. EU. DONNA, Feld. Wien. ent. Monats. 1862, p. 410; Reise d. Novara, p. 288, pl. xxxv. f. 5, 6.

Hab. Bogotá.

5. EU. UPIS, Hübn. Samml. ex. Schm. ii.

Local var. *Eu. Franciscana* (Bates), Feld. W. ent. M. 1862, p. 70.

Hab. Brazil, Amazons.

6. EU. LAMIA, Cram. pl. 150. f. C, ♂.

Hab. Surinam.

7. EU. LYCISCA, D. W. & H. Gen. D. L. pl. 69. f. 4.

? Local var. *Eu. Lamia*.

Hab. Honduras.

8. EU. HALIMEDE, Hübn. Samml. ex. Schm. i.

Hab. Bahia, Amazons.

9. EU. JUTURNA, Felder, Reise der Novara, Zool. ii. 2. p. 288.

Hab. Surinam, Amazons.

Genus EUNOGYRA.

Westw. D. W. & H. Gen. D. L. p. 463.

1. EU. SATYRUS, D. W. & H. Gen. D. L. pl. 72. f. 11.

Hab. Upper Amazons.

2. EU. CURUPIRA, Bates.

Satyryus, H.-Schäff. Exot. Schm. f. 41 (nec Westw.).*Hab.* Lower Amazons.

Genus MESOSEMIA.

Mesosemia, Hübn. Verz. bek. Schm. p. 21 (1816); Westw. in D. W. & H. Gen. D. L. p. 453.*Diopthalma*, Blanchard, Anim. Art. iii. p. 466 (1840).

1. M. STELI (Bdv.), Hewits. Exot. Butt. Mes. f. 13, ♀.

Hab. Amazons.

2. M. NESTI (Bdv.), Hewits. Exot. Butt. Mes. f. 11, 12, ♂.

Hab. Cayenne.

3. M. EUMENE, Cram. pl. 92. f. F, G (1779), ♂.

Eumenus, Fab. Sp. Ins. ii. p. 307. n. 68 (1781).*Eumenus*, Hewits. Exot. Butt. Mes. f. 38, ♀.*Hab.* Surinam, Amazons.

4. M. ULRICA, Cram. pl. 100. f. E, F (1779), ♂.

Ultricus, Fab. Mant. Ins. ii. 735. 82 (1787).*Hab.* Surinam, Amazons.

5. M. TITEA, Stoll, Suppl. Cram. pl. 5. f. 6, ♂.

♀ ? *Rosina*, Cram. pl. 326. f. B (1782).♀ ? *Renatus*, F. Mant. ii. 330. 31 (1787).*Hab.* Surinam.

6. M. MACELLA, Hewits. Exot. Butt. Mes. f. 28, 29, 30, ♂ ♀.

Hab. Amazons.

7. M. ODICE, Godt. Enc. M. 583. 88; Hewits. Exot. Butt. Mes. f. 14.

Hab. S. Brazil.

8. M. RHODIA, Godt. Enc. M. 583. 89; Hewits. Exot. Butt. Mes. f. 15.

Hab. S. Brazil.

9. M. MÆSIA, Hewits. Exot. Butt. Mes. f. 7. 8.

Hab. S. Brazil.

10. M. TELEGONE, Bdv. Sp. Gén. pl. 21. f. 2, ♂; Hewits. Exot. Butt. Mes. f. 9, 10, var. ?

Hab. New Granada, S^{ta} Martha.

11. M. LAMACHUS, Hewits. Exot. Butt. Mes. f. 3, 4, 5, 6.

Hab. Honduras, Guatemala.

12. M. AMIANA, Feld. Wien. ent. Monats. 1861, p. 100.
Hab. Caraccas.
13. M. GAUDIOLUM, Bates, Entom. Monthly Mag. i. p. 202.
Hab. Guatemala.
14. M. CARISSIMA, Bates, Entom. Monthly Mag. iii. 1866, p. 153.
Hab. Veragua.
15. M. MESSEIS, Hew. Exot. Butt. Mes. f. 75, ♂.
Hab. Amazons.
16. M. MELETIA, Felder, Reise der Novara, Zool. ii. 2. p. 297 (*Diophtalma Meletia*).
Hab. Bogotá.
17. M. MEVANIA, Hew. Exot. Butt. Mes. f. 1, 2.
Hab. New Granada.
18. M. MACRINA.
Diophtalma Macrina, Felder, Reise der Novara, Zool. ii. 2. p. 296.
Hab. Bogotá.
19. M. METUANA.
Diophtalma Metuana, Felder, Reise der Novara, Zool. ii. 2. p. 297.
Hab. Bogotá.
20. M. MÆNADES, Hew. Exot. Butt. Mes. f. 18.
Hab. New Granada.
21. M. PHELINA, Felder, Wien. entom. Monats. 1862, p. 411; Reise der Novara, Zool. ii. 2. p. 298, t. xxxviii. f. 9, 10, ♂.
Hab. Bogotá.
22. M. MEEDA, Hew. Exot. Butt. Mes. f. 16, 17.
Hab. Brazil.
23. M. EPIDIUS (Bdv.), Hew. Exot. Butt. Mes. 45, 46, 47, ♂ ♀.
Hab. Cayenne.
24. M. ANTÆRICE, Hewits. Exot. Butt. Mes. f. 52, 53.
Hab. Amazons.
25. M. CALYPSO, n. s., *suprà*, p. 374.
Hab. Upper Amazons.
26. M. CIPPUS (Bdv.), Hew. Exot. Butt. Mes. f. 48, 49, ♂.
Mæotis, Hew. Exot. Butt. Mes. f. 50, 51, ♀.
Hab. Amazons.
27. M. SYLVINA, n. s., *suprà*, p. 372.
Hab. Lower Amazons.
28. M. MENÆTES, Hew. Exot. Butt. Mes. f. 56, 57, 58, ♂ ♀.
Hab. Upper Amazons.

29. *M. PHILOCLES*, L. S. N. ii. 791. 240 ; Clerck, Icones, t. 45. f. 5, 6 ;
Cram. pl. 184. f. D, E (not F), ♂.
Hab. Lower Amazons, Surinam.

Var. *M. Egabella*, Bates, *suprà*, p. 374 ; Hew. Exot. Mes. f. 62, 63 ♂,
f. 61 ♀.

Hab. Upper Amazons.

Var. *M. lætifera*, Bates, *suprà*, p. 373.

Hab. Pará.

30. *M. MYONIA*, Hew. Exot. Butt. Mes. f. 59, 60, ♀.
? Var. *Philocles* ♀.

Hab. Amazons.

31. *M. MACHÆRA*, Hew. Exot. Butt. Mes. f. 70, 71, ♂.
Hab. Amazons.

32. *M. MAGETE*, Hew. Exot. Butt. Mes. f. 72.
Hab. Amazons.

33. *M. METOPE*, Hew. Exot. Butt. Mes. f. 64, 65, ♂.
Hab. Amazons.

34. *M. OLIVENCIA*, Bates, *suprà* p. 373.
Hab. Upper Amazons.

35. *M. THYMETUS*, Cram. pl. 184. f. G.
Var. ? *Osinia*, Cram. pl. 115. f. F.
Hab. Surinam, Amazons.

36. *M. SIFIA*, Bdv. Sp. Gén. pl. 6. f. 9.
Hab. Brazil.

37. *M. MELÆNÆ*, Hew. Exot. Butt. Mes. f. 54, 55, ♂.
Hab. Amazons.

38. *M. METHION*, Hew. Exot. Butt. Mes. f. 76.
Hab. Brazil.

39. *M. MINOS*, Hew. Exot. Butt. Mes. f. 39, 40, 41, ♂ ♀.
Hab. Amazons.

40. *M. TRAGA*, Hew. Exot. Butt. Mes. f. 42, 43, 44, ♂ ♀.
Philocles ♀, Cramer, pl. 184. f. F.
Hab. Surinam, Amazons.

41. *M. MOSERA*, Hew. Exot. Butt. Mes. f. 77, 78, 79, ♂ ♀.
Hab. Amazons.

42. *M. MELESE*, Hew. Exot. Butt. Mes. f. 74.
Hab. Amazons.

43. *M. IBYCUS*, Hew. Exot. Butt. Mes. f. 68, 69, ♂ ♀.
Hab. Amazons.

44. *M. MELPIA*, Hew. Exot. Butt. Mes. f. 66, 67, ♂ ♀.
Hab. Amazons.

45. *M. FORMOSA* (Hewits.), Westw. in D. W. & H. Gen. D. L. p. 454, pl. 71. f. 5 (not 6).

Hab. Amazons.

46. *M. MISIPSA*, Hew. Exot. Butt. Mes. f. 33, 34, 35, ♂ ♀.

? *Ephyne*, Cram. pl. 93. f. E, F (1779).

? *Ephynes*, F. Sp. Ins. ii. 338. 68 (1781).

Hab. Amazons.

47. *M. IDOTEA*, Westw. in D. W. & H. Gen. D. L. p. 455, ♀ (1851).

Hewits. Exot. Butt. Mes. f. 36, 37, ♂ ♀.

Mirita, H.-Schäff. Exot. Schm. p. 55, f. 42, ♂ (1853).

Hab. Amazons.

48. *M. PHILEMON*, Cram. pl. 22. f. G, H (1775).

Icarus, Fab. Mant. ii. 705. 77 (1787).

Hab. Guiana, Amazons.

49. *M. LAGORA*, H.-Schäff. Exot. Schm. p. 55, f. 43, 44; Hewits. Exot.

Butt. Mes. f. 20, var. ?

Hab. New Granada.

50. *M. VESTALIS*, Bates, Entom. Monthly Mag. i. p. 203.

Hab. Guatemala.

51. *M. HYPHÆA*, Cram. pl. 92. f. C (1779).

Hyphæus, Fab. Sp. Ins. ii. 305. 67 (1781).

Hab. Surinam, Amazons.

52. *M. MATISCA*, Hew. Exot. Butt. Mes. f. 73.

Hab. Amazons.

53. *M. MACARIS*, Hewits. Exot. Butt. Mes. f. 31, 32, ♂ ♀.

Hab. Amazons.

54. *M. GEMINUS*, Fab. Ent. Syst. iii. 1. 322. 220; Hewits. Exot. Butt.

Mes. f. 21, 22, ♂ ♀.

Cælestina, Ménétr. Cat. Mus. St. Petersb. pl. 6. f. 7.

Hab. S. Brazil.

55. *M. CRÆSUS*, Fab. Gen. Ins. Mant. 259 (1776), ♂ ; Hewits. Exot.

Butt. Mes. f. 25, 26, ♀.

Capanæus, Cram. pl. 236. f. D (1782), ♂.

Tullius, Fab. E. S. iii. 1. 704. 224, ♀.

Var., ♀, *Meana*, Hewits. Exot. Butt. Mes. f. 23, 24.

? Var., ♀, *Gneris* (Bdv.), D. W. & H. Gen. D. L. pl. 71. f. 6.

Hab. Surinam, Cayenne, Amazons.

56. *M. MARISA*, Hewits. Exot. Butt. Mes. f. 27, ♀.

Hab. Amazons.

57. *M. TENERA* (Bdv.), Westw. in D. W. & H. Gen. D. L. p. 455 ;

Hewits. Exot. Butt. Mes. f. 19.

Hab. Venezuela, Amazons.

58. M. MARTHA, Prittwitz, Stettin. ent. Zeit. 1865, p. 315.

Hab. Rio Janeiro.

Genus CREMNA.

Cremna (Dbldy.), Westw. D. W. & H. Gen. D. L. p. 456.

1. C. CENEUS, Cram. pl. 156. f. F (fig. bad); Westw. G. D. L. p. 456, desc.

Hab. Guiana, Amazons.

2. C. HETERCEA, Bates, Tr. Ent. Soc. v. 3rd ser. p. 542.

Hab. Upper Amazons.

3. C. BELTIANA, Bates, Tr. Ent. Soc. v. 3rd ser. p. 541.

Hab. Montes Aureos, Maranham.

4. C. ACTORIS, Cram. pl. 93. f. D, ♂ (bad figure?).

Hab. Surinam.

5. C. EUCHARILA, Bates.

Actoris, Hübn. Exot. Schm. i. (nec Cram.).

Hab. Amazons, Bahia.

6. C. PHRYXE, Felder, Reise der Novara, Zool. ii. 2. p. 299, t. xxxvii.
f. 23, 24, ♀.

Hab. Bahia.

7. C. MELAMPIA, Bates, Tr. Ent. Soc. v. 3rd ser. p. 543.

Hab. Bahia.

Genus HYPHILARIA.

Hyphilaria, Hübn. Verz. p. 26.

Bæotis, Westw. D. W. & H. Gen. D. L. p. 451. § 1.

1. H. ANOPHTHALMA.

Diophtalma anophtalma, Felder, Reise der Novara, Zool. ii. 2.
p. 298, t. xxxviii. f. 7, 8.

Hab. Bogotá.

2. H. NICIAS, Stoll, Suppl. Cram. pl. 13. f. 3.

Nicon, Godt. Encyc. Méth. 588. 19.

Hab. Surinam, Amazons.

3. H. PARTHENIS (Dbld.), D. W. & H. Gen. D. L. pl. 71. f. 1, ♂.

Cydias, Westw. Gen. D. L. p. 451, ♀.

Hab. Amazons.

Subfamily 2. EURYGONINÆ.

Branches of the fore-wing subcostal nervure variable in number.

Lower radial nervure emitted straight from the subcostal, or connected with it by an oblique perfect discocellular nervule.

Genus EURYGONA.

Eurygona (Boisduval), Westwood in D. W. & H. Gen. D. L. p. 437.

1. EU. ZARA (Hewits.), D. W. & H. Gen. D. L. p. 438, pl. 71. f. 7, ♂;
Hewits. Exot. Butt. Eur. f. 72, 73, ♀.

Hab. Brazil.

2. EU. UZITA, Hewits. Exot. Butt. Eur. f. 12, 13, ♂.
Hab. Amazons.
3. EU. EUCRITUS, Hewits. Exot. Butt. Eur. f. 14, 15 ♂, 16 ♀.
Hab. Amazons.
4. EU. ZENA, Hewits. Exot. Butt. Eur. f. 74 & 76, ♂.
Hab. Amazons.
5. EU. COCCINELLA, n. s., *suprà*, p. 374 ♂.
Zena ♀, Hewits. Exot. Butt. Eur. f. 75, ♀.
Hab. Amazons.
6. EU. EUTÆA, Hewits. Exot. Butt. Eur. f. 8, 9, ♀.
Hab. Amazons.
7. EU. GELON, Stoll, Suppl. Cram. pl. 5. f. 2, 2 B, ♀ ?
Hab. Surinam.
8. EU. SABINUS, Stoll, Suppl. Cram. pl. 9. f. 3, 3 A, ♂.
Hab. Surinam.
9. EU. ERYTHRÆA, n. s., *suprà*, p. 375.
Hab. Amazons.
10. EU. EURITÆUS, Cram. pl. 152. f. D, E, ♂; Hewits. Exot. Butt. Eur.
f. 10, 11, ♀.
Hab. Guiana, Amazons.
11. EU. CHARILIS, n. s., *suprà*, p. 375.
Hab. Upper Amazons.
12. EU. CALLIGRAMMA, n. s., *suprà*, p. 375.
Hab. Upper Amazons.
13. EU. EUTYCHUS, Hewits. Exot. Butt. Eur. f. 44, 45, 46, ♂ ♀.
Orfita, Cram. (part.), pl. 112. f. D, E.
Hab. Surinam, Amazons.
14. EU. CLITHRA, n. s., *suprà*, p. 377.
Hab. Pará, Maranhão.
15. EU. FERRUGO, n. s., *suprà*, p. 376.
Hab. Ega, Amazons.
16. EU. PHÆDICA, Bdv. Sp. Gén. pl. 21. f. 3, ♂; Hewits. Exot. Butt.
Eur. f. 47, 48, 49, ♂ ♀.
Hab. Cayenne, Amazons.
17. EU. ORFITA, Cram. pl. 112. f. F ♂; Hewits. Exot. Butt. Eur. f. 50,
51, ♂ ♀.
Hab. Surinam, Amazons.
18. EU. EUODIAS, Hewits. Exot. Butt. Eur. f. 42, 43, ♂.
Hab. Amazons.

19. EU. EURYONE, Hewits. Exot. Butt. Eur. f. 53, 54.
Hab. Amazons.
20. EU. MELAPHÆA, Hübn. Zutr. f. 209, 210.
Hab. Amazons.
21. EU. EULIONE, Hewits. Exot. Butt. Eur. f. 52.
Hab. Amazons.
22. EU. HYGNIUS, Stoll, Suppl. Cram. pl. 9. f. 2, 2 B, ♂.
Hab. Surinam, Amazons.
23. EU. CAFUSA, Bates.
Mys, Hewits. (part.) Exot. Butt. Eur. f. 57, .
Hab. Amazons.
24. EU. MYS, H.-Schäff. Exot. Schm. f. 37, 38; Hewits. Exot. Butt. Eur. f. 55, 56, 58, 59, 60, 61, ♂ ♀.
Hab. Amazons.
25. EU. CROTOPUS, Cram. pl. 336. f. E, F, ♂ (1782); ♀, Hewits. Exot. Butt. Eur. f. 36 (as *Midas*, F.).
 ♀ ? *Midas*, Fabr. Mant. ii. 718. 79 (1787).
 Var., ♂, Hewits. Exot. Butt. Eur. f. 37 (as *Midas*, F.).
Hab. Guiana, Amazons.
26. EU. EXTENSA, n. s., *suprà*, p. 377.
Hab. Upper Amazons.
27. EU. EUBOTES, Hewits. Exot. Butt. Eur. f. 64.
Hab. Amazons.
28. EU. URIA, Hewits. Exot. Butt. Eur. f. 22, ♂.
Hab. Amazons.
29. EU. LISIAS, Cram. pl. 152. f. F, G, ♂.
Salimba, Godt. Enc. Méth. 568. 17.
Hab. Surinam, Amazons.
30. EU. EUROMUS, Hewits. Exot. Butt. Eur. f. 70, 71, ♂.
Hab. Amazons.
31. EU. EUHEMERUS, Hewits. Exot. Butt. Eur. f. 65, 66, ♀.
 ? ♀ *Euromus*.
Hab. Amazons.
32. EU. DORINA, Hewits. Exot. Butt. Eur. f. 80, 81.
Hab. Amazons.
33. EU. EUBAGES, Hewits. Exot. Butt. Eur. f. 68, 69, ♀.
Hab. Amazons.
34. EU. EUORAS, Hewits. Exot. Butt. Eur. f. 38, 39, 40, ♂ ♀.
Hab. Amazons.

35. EU. VIOLETTA, n. s., *suprà*, p. 378.

Hab. Tapajos, Amazons.

36. EU. ARBAS, Cram. pl. 379. f. L, M, ♂; Hew. Exot. Butt. Eur. f. 41, ♀.

Hab. Surinam, Amazons.

37. EU. ANICA, H.-Schäff. Exot. Schm. f. 31, 32, ♀ (probably ♀ *Arbas*).

Hab. Surinam.

38. EU. MODESTA, n. s., *suprà*, p. 376.

Hab. Tapajos, Amazons.

39. EU. EUNÆUS, Hewits. Exot. Butt. Eur. f. 4, 35, ♂.

Hab. Amazons.

40. EU. GELANOR, Cram. pl. 336. f. C, D, ♂; Hewits. Exot. Butt. Eur. f. 20, 21.

Hab. Surinam, Amazons.

41. EU. EUMENES, Hewits. Exot. Butt. Eur. f. 18, ♂.

Hab. Amazons.

42. EU. EUSEPUS, Hewits. Exot. Butt. Eur. f. 17, ♂.

Hab. S. Brazil.

43. EU. URITES, Hewits. Exot. Butt. Eur. f. 19, ♂.

Hab. Amazons.

44. EU. CHRYSIPPE, Bates, Entom. Monthly Mag. iii. p. 154.

Hab. Veragua.

45. EU. LABDACUS, Cram. pl. 336. f. G, H, ♂.

Hab. Surinam.

46. EU. UTICA, Hewits. Exot. Butt. Eur. f. 29, 30, 31.

Hab. Brazil.

47. EU. TELECLUS, Stoll, Suppl. Cram. pl. 5. f. 4, 4 E (1791).

Gemellus, Fab. E. S. iii. 1. 319. 208 (1793)?

Catoleuce, Hübn. Zutr. f. 207, 208 (1823).

Hab. Guiana, Amazons.

48. EU. GYDA, Hewits. Exot. Butt. Eur. f. 79, ♂.

Hab. Brazil.

49. EU. EUPHAES, Hewits. Exot. Butt. Eur. f. 27, 28, ♂.

Hab. Amazons.

50. EU. OPALINA, Westw. in D. W. & H. Gen. D. L. p. 438, ♂;

Hewits. Exot. Butt. Eur. f. 25, 26, ♂.

Hab. Amazons.

51. EU. OPALESCENS, Hewits. Exot. Butt. Eur. f. 23, 24.

Hab. S. Brazil.

52. EU. MAZACA, Hewits. Exot. Butt. Eur. f. 77, 78, ♂.

Hab. Amazons.

53. EU. ARTOS, H.-Schäff. Exot. Schm. f. 35, 36, ♂.

Hab. Amazons.

54. EU. EUMEDIA, Hewits. Exot. Butt. Eur. f. 6, 7, ♂.

Ophias, H.-Schäff. Exot. Schm. f. 33, 34, ♂.

Hab. Amazons.

55. EU. PELOR (Dblly.), Hewits. Exot. Butt. Eur. f. 1, 2, 3, ♂ ♀.

Hab. Amazons.

56. EU. EUBÆA, Hewits. Exot. Butt. Eur. f. 4, 5, ♂.

Hab. Amazons.

57. EU. MIRANIA, n. s., *suprà*, p. 376.

Hab. Upper Amazons.

58. EU. ANGULATA, n. s., *suprà*, p. 376.

Hab. Upper Amazons.

59. EU. EURYPUS, Hewits. Exot. Butt. Eur. f. 63.

Hab. Amazons.

60. EU. CLESA (Bdv.), Hewits. Exot. Butt. Eur. f. 67.

Hab. Brazil.

61. EU. EUPLÆA, Hewits. Exot. Butt. Eur. f. 32, 33.

Hab. S. Brazil.

62. EU. EUGÆON, Hewits. Exot. Butt. Eur. f. 62.

Hab. Amazons.

63. EU. THUCYDIDES, Fab. E. S. iii. 1. 323. 225 (1793); Don. Ins.

Ind. pl. 43. f. 1.

Nycha, Hübn. Zutr. f. 279, 280 (1823).

Arisbas, Dalm. Anal. Entom. p. 43 (1823).

Hab. Brazil.

64. EU. APISAON, Dalm. Anal. Entom. p. 43.

Hab. Brazil.

Genus METHONELLA.

Methonella, Westwood, in D. W. & H. Gen. D. L. p. 533.

1. M. CECILIA, Cramer, pl. 159. f. D, E, ♀.

Cicilia, Cramer, pl. 376. f. G, H, ♂.

Hab. Surinam, Amazons.

Subfamily 3. ERYCININÆ.

Three branches to the fore-wing subcostal nervure*. Lower

* Except in the genus *Isapis*, which offers a curious aberration in its neuration; it has only two fore-wing subcostal branches—one emitted at the end of the cell, and the other at a distance beyond it.

radial of both wings connected with the subcostal, at a right angle, by a discocellular nervule more or less rudimentary.

- A. *Antennæ dark-coloured, without white rings or spots. Fore-wing subcostal nervure, in the majority of genera, emitting its second branch after the end of the cell.*

Genus THEMONE.

Themone, Westw. in D. W. & H. Gen. D. L. p. 461.

1. TH. PAIS, Hübn. Samml. exot. Schm. ii.; Zutr. f. 749, 750; D. W. & H. Gen. D. L. pl. 72. f. 9.

? *Halius*, Dalman, Anal. Ent. p. 45. n. 16.

Hab. Brazil, Amazons.

2. TH. PÆCILA, n. s., *suprà*, p. 378.

Hab. Upper Amazons.

3. TH. (?) PULCHERRIMA, Herrich-Schäff. Exot. Schm. pp. 55 & 77, f. 26, 27.

Hab. Surinam.

Genus NOTHEME.

Notheme, Westw. in D. W. & H. Gen. D. L. p. 462.

1. N. OURANUS, Cram. pl. 335. f. C (fig. bad); Fab. E. S. iii. 1. 317. 200.
♀ *Amblygonia agathon*, Felder, Reise der Novara, Zool. ii. 2. p. 308, t. xxxvii. f. 25, 26.

Hab. Surinam, Amazons, Bahia.

2. N. (?) AMARYNTHINA. *Amblygonia amarynthina* Felder, Reise der Novara, Zool. ii. 2. p. 309.

Hab. New Granada.

Genus PANARA.

Panara, Westw. in D. W. & H. Gen. D. L. p. 442.

1. P. IARBAS, Drury, Ill. iii. pl. 8. f. 2 ♀ (1783). *P. Perditus*, Fab. E. S. iii. 1. 323. 222 (1793); Hübn. Samml. ex. Schm. ii.

Hab. S. Brazil.

2. P. PHERECLUS, Linn. S. N. 792, 248; Clerck, Icones, t. 45. f. 4 ♂ (1759); Cramer, pl. 178. f. D (fig. bad)?

P. Barsacus, D. W. & H. Gen. D. L. pl. 72. f. 10 ♂.

Hab. Surinam, Amazons.

Genus LYMNAS.

Lymnas (Bdv.), Blanch. Anim. Artic. iii. p. 464 (1840).

Limnas, Westw. in D. W. & H. Gen. D. L. p. 459 (1851).

1. L. SMITHIÆ (Bdv.), D. W. & H. Gen. D. L. pl. 73. f. S.

Hab. Brazil.

2. *L. ZOEGA*, Hewits. Exot. Butt. Lim. f. 2.
Hab. Minas Geraes, Amazons.
3. *L. FLAMMULA*, n. s., *suprà*, p. 380.
Hab. Upper Amazons.
4. *L. UNXIA*, Hewits. Exot. Butt. Lim. f. 3; Ménétr. Cat. St. Petersb. t. iv. f. 2, p. 94, slight var.
Hab. S. Brazil.
5. *L. XARIFA*, Hewits. Exot. Butt. Lim. f. 1.
Hab. Venezuela.
6. *L. VOLUSIA*, Hewits. Exot. Butt. Lim. f. 4.
Hab. Rio Janeiro.
7. *L. PIXE*, Bdv. Sp. Gén. pl. 20. f. 1.
Hab. Mexico.
8. *L. MELANTHO*, Ménétr. Cat. St. Petersb. t. iii. f. 7, p. 93.
Hab. Nicaragua.
9. *L. ELECTRON*, Fab. E. S. iii. l. 321. 214.
Hab. Cayenne.
10. *L. MELANDER*, Cram. pl. 336. f. A.
Electron, Godt. Enc. Méth. 590. 130?; var. ? Cram. pl. 336. f. B;
var. ? Ménétr. Cat. St. Petersb. t. iv. f. 1.
Hab. Surinam, Amazons.
11. *L. UBIA*, Felder, Reise der Novara, Zool. ii. 2. p. 303; ? var. *Melander*.
Hab. Cayenne, Obydos, Lower Amazons.
12. *L. LYCEA*, Hübn. Zutr. f. 283, 284.
Hab. Bahia.
13. *L. XENIA* (Bdv.), Hewits. Exot. Butt. Lim. f. 11.
Hab. Minas Geraes.
14. *L. BARCA* (Bdv.), Hewits. Exot. Butt. Lim. f. 12.
Hab. Brazil.
15. *L. ERYTHRUS*, Ménétr. Cat. St. Petersb. t. iii. f. 8, p. 93.
Hab. Brazil.
16. *L. AGRIA* (Bdv.), Hewits. Exot. Butt. Lim. f. 10.
Hab. Brazil.
17. *L. LYCISCA*, Hewits. Exot. Butt. Lim. f. 7, 8, 9.
Hab. Minas Geraes.
18. *L. INARIA*, D. W. & H. Gen. D. L. pl. 73. f. 7.
Hab. Amazons.
19. *L. THYATIRA*, Hewits. Exot. Butt. f. 6.
Hab. Amazons.

20. L. CEPHISE.

Lyropteryx Cephise, Ménétr. Cat. St. Petersb. p. 89, pl. iii. f. 3.*Hab.* Nicaragua.21. L. SEMIOTA, n. s., *suprà*, p. 380.*Hab.* Tapajos, Amazons.

Genus DRYAS.

Dryas, Felder, Reise der Novara, Zool. ii. 2. p. 305.

1. D. CINARON, Felder, Reise der Novara, Zool. ii. 2. 305, t. xxxviii. f. 13, 14.

Limnas Cinaron, Felder, Wien. ent. Monats. 1861, p. 101.*Hab.* Bogotà.

Genus XENANDRA.

Xenandra, Felder, Reise der Novara, Zool. ii. 2. p. 304.

1. X. HELIUS, Cram. pl. 198. f. B ♂.

♀ ? *Phereclus*, Cram. pl. 178. f. D (nec Clerck).*Hab.* Surinam.

2. X. HELIOIDES, Felder, *l. c.* p. 304, t. xxxviii. f. 19, 20, 21, 22 ♀ ♂.

Hab. Bahia, Amazons.

Genus LYROPTERYX.

Lyropteryx, Westw. Gen. D. L. p. 433.

1. L. APOLLONIA, Westw. in D. W. & H. Gen. D. L. p. 433, pl. 72. f. 1 ♂.

L. Apollonia ♀, Saunders, Trans. Ent. Soc. 2nd ser. v. p. 109, pl. xi. f. 19.*Hab.* Amazons.

2. L. LYRA, Saund. Trans. Ent. Soc. 2nd ser. v. p. 109.

Hab. New Granada.

3. L. TERPSICHORE, Westw. in D. W. & H. Gen. D. L. p. 433; Ménétr. Cat. Lep. Mus. St. Petersb. t. iii. f. 2.

Hab. Minas Geraes, R. Tapajos.

Genus CYRENIA.

Cyrenia, Westw. in D. W. & H. Gen. D. L. p. 434.

1. C. MARTIA, Westw. in D. W. & H. Gen. D. L. p. 434, pl. 72. f. 2.

Hab. Amazons.

2. C. (?) BELPHEGOR, Westw. in D. W. & H. Gen. D. L. p. 430, pl. 70. f. 1.

Hab. Amazons.

Genus HADES.

Hades, Westw. in D. W. & H. Gen. D. L. p. 435.*Moritzia*, Felder, Wien. ent. Monats. 1861, p. 100.

1. H. NOCTULA, Westw. in D. W. & H. Gen. D. L. p. 434, pl. 72. f. 3.

M. paradoxa, Felder, Wien. ent. Monats. 1861, p. 100.*Hab.* Venezuela.

Genus NECYRIA.

Necyria, Westw. in D. W. & H. Gen. D. L. p. 432.

1. N. *BELLONA*, Westw. in D. W. & H. Gen. D. L. p. 432, pl. 73. f. 9.
Hab. West Brazil.
2. N. *DUELLONA*, Westw. in D. W. & H. Gen. D. L. p. 432.
Hab. Ecuador.
3. N. *MANCO*, Saund. Trans. Ent. Soc. 2nd ser. v. p. 107, pl. xi. f. 16=
N. *fulminatrix*, Feld. Wien. ent. Monats. 1861, p. 101; Reise der
Novara, Zool. ii. 2. p. 291, t. xxxvi. f. 1, 2.
Hab. Bogotá, New Granada.
4. N. *SAUNDERSII*, Hewits. Trans. Ent. Soc. 2nd Ser. ii. pl. 22. f. 1.
Hab. New Granada.
5. N. *HEWITSONII*, Saund. Trans. Ent. Soc. 2nd Ser. v. p. 107, pl. x.
f. 9, 10.
Hab. New Granada.
6. N. *LINDIGII*, Feld. Wien. ent. Monats. 1862, p. 411; Reise der
Novara, Zool. ii. 2. p. 291, t. xxxvi. f. 3, 4.
Hab. Bogotá.

Genus ERYCINA.

Erycina (Fabr. Syst. Gloss.), Westw. Gen. D. L. p. 428.

1. E. *MELIBÆUS*, Fab. Gen. Ins. Mant. p. 271 (1776), ♂; Westw. in
D. W. & H. Gen. D. L. p. 430, ♂ ♀.
Pyretus, Cram. pl. 144. f. A, B (1779), ♂.
Julia, Saund. Trans. Ent. Soc. v. pl. 21. f. 1, 1a, ♂, f. 2, 2a, ♀.
Hab. Surinam, Amazons.
2. E. *MINIOLA*, n. s., *suprà*, p. 384.
Hab. Upper Amazons.
3. E. *AULESTES*, Cramer, pl. 128. f. G (1779), ♀.
Melibæus, Boisd. Sp. Gén. pl. 6. f. 12, ♂; Morisse, Ann. Soc. Ent.
Fr. vi. p. 426, ♂.
Pyretus, Saunders, Tr. Ent. Soc. v. pl. 21. f. 4, 4a, ♂.
Glaphyra, Saunders, Tr. Ent. Soc. p. 222, pl. 21. f. 3, ♀.
Julia, Westw. D. W. & H. Gen. D. L. p. 430, ♂ (1851).
Hab. Surinam, Amazons.
4. E. *TEDEA*, Cram. pl. 102. f. A ♀; Saund. Tr. E. S. v. 223, pl. 23.
f. 2, 2a, ♀.
Hab. Surinam, Amazons.
5. E. *COLUBRA*, Saund. Tr. E. S. 2nd Ser. v. p. 103, pl. 11. f. 12, ♂.
Hab. Amazons.
6. E. *ETIAS*, Saund. Tr. E. S. 2nd Ser. v. p. 102, pl. 11. f. 11, ♂.
Hab. Peru.

7. *E. ERYXO*, Saund. Tr. E. S. 2nd. Ser. v. p. 104, pl. 11. f. 13, ♀:
probably ♀ of *E. Etias*.
Hab. Peru.
8. *E. MONTEZUMA*, Saund. Tr. E. S. v. p. 226, pl. 21. f. 5, ♂.
Jurgensenii, Saund. l. c. p. 220, pl. 20. f. 3, ♀.
Hab. Mexico.
9. *E. CALLIAS*, Feld. Wien. ent. Monats. 1862, p. 71.
Hab. Upper Rio Negro.
10. *E. HUASCAR*, Saund. Tr. E. S. 2nd Ser. v. p. 101, pl. 11. f. 15, ♂.
Hab. New Granada.
11. *E. PAUSIAS*, Felder, Reise der Novara, Zool. ii. 2. 290, t. xxxvi.
f. 7, 8.
Hab. Bogotá.
12. *E. CACICA*, Felder, l. c. p. 290.
Hab. New Granada.
13. *E. INCA*, Saund. Tr. E. S. v. p. 227, pl. 21. f. 6, 6a, ♂.
Hab. Mexico, Guatemala.
14. *E. ATAHUALPA*, Saund. Tr. E. S. v. 2nd Ser. p. 101, pl. 11.
f. 14, ♂.
Hab. New Granada.
15. *E. ARISTODORUS* (Bdv.), Morisse, Ann. S. E. F. vi. p. 420, ♂.
Hab. Cayenne, Amazons.
16. *E. PANDAMA* (Dbldy.), Saund. Tr. E. S. v. 222, pl. 20. f. 5, 5a, ♀.
Hab. Bahia.
17. *E. OCOLLO*, Saund. Tr. E. S. 2nd Ser. v. p. 105, pl. 10. f. 6, 7, ♀.
Hab. New Granada.

Genus DIORHINA.

Diorhina (Bdv.), Morisse, Ann. S. E. F. vi. p. 422.

1. *D. PERIANDER*, Cram. pl. 188. f. C, ♀.
Iphinoe, Hbn. Samml. exot. Schm. iii., ♂ ♀; Godt. Enc. Méth. ix.
p. 565. n. 7, ♂ ♀.
Laonome, Morisse, Ann. S. E. F. vi. p. 422, pl. 14. f. 5, 6, ♂.
Hab. Venezuela, Surinam, Amazons.
2. *D. DYSONII*, Saund. Tr. E. S. v. 218, pl. 20. f. 1, 1a, ♂, 2, 2a, ♀.
Hab. Venezuela.
3. *D. PSECAS*, Saund. Tr. E. S. v. p. 219, pl. 20. f. 4, 4a, ♂.
Local var. *Laodamia*, Feld. Wien. ent. Monats. 1862, p. 71; Reise
der Novara, Zool. ii. 2. p. 289.
Hab. Bolivia, Upper Rio Negro.
4. *D. BUTES*, Clerck, Icones, pl. 46. f. 6 (1759).
Licarsis, Fab. E. S. iii. 1. 83. 28 (1793); Bdv. Sp. Gén. pl. 20. f. 6; Mo-
risse, Ann. S. E. F. vi. pl. 14. f. 1, 2. Butler, Ent. M. Mag. i. p. 54.

♀ ?, *Rhetus*, Cram. pl. 63. f. G (1775).

Huana, Saund. Tr. E. S. 2nd ser. v. p. 100, ♂.

Rhetus Crameri, Swains. Zool. Ill. 2nd ser. t. 33.

Hab. Surinam, Amazons.

5. D. THIA, Morisse, Ann. S. E. F. vi. p. 419, t. 14. f. 3, 4.

?Local var. *Butes*.

Hab. Mexico, Honduras.

Genus ZEONIA.

Zeonia (Swainson), Westw. D. W. & H. Gen. D. L. p. 431.

1. Z. XANTIPPE, Gray, Griffith's An. K. pl. 102. f. 1 (1832); D. W. & H. Gen. D. L. pl. 72. f. 4.

Morissei (Bdv.), Morisse, Ann. S. E. F. vi. p. 427, pl. 14. f. 7, 8 (1838).

Hab. S. Brazil.

2. Z. HELICONIDES, Swains. Zool. Ill. 2nd ser. pl. iii; Morisse, Ann. S. E. F. vi. p. 428; Saund. Trans. E. S. 2nd ser. v. pl. x. f. 5, ♀.

Hab. N. Brazil.

3. Z. TIMANDRA, Saund. Tr. E. S. v. p. 228, pl. 23. f. 1, 1 a.

Hab. Brazil.

4. Z. SYLPHINA, n. s., *suprà*, p. 383.

Hab. Ecuador.

5. Z. CHORINÆUS, Cram. pl. 59. f. A (1775).

Octavius, Fab. Mant. ii. 72. 9 (1787); Morisse, Ann. S. E. F. vi. p. 426.

Faunus, Fab. Sp. Ins. ii. 93. 15 (1781).

Hab. Surinam, Amazons, Maranham.

6. Z. AMAZONA, Saund. Tr. E. S. 2nd ser. v. p. 97, pl. x. f. 3, 4, ♂ ♀.

Hab. Upper Amazons.

7. Z. BOGOTA, Saund. Tr. E. S. 2nd ser. v. p. 98.

Hab. Bogotá.

8. Z. BATESII, Saund. Tr. E. S. v. 2nd ser. p. 99, pl. x. f. 1, 2, ♂ ♀.

Hab. Tapajos.

Genus PHELES.

Pheles (Boisd.), Herrich-Schäffer, Exot. Schmett. p. 77.

1. PH. HELICONIDES, H.-Schäff. Exot. Schm. p. 77, f. 30.

Hab. Surinam, Amazons.

2. PH. RUFOTINCTA, n. s., *suprà*, p. 379.

Hab. Upper Amazons.

Genus ITHOMEIS.

Ithomeis, Bates, Trans. Linn. Soc. vol. xxiii. p. 541 (Sept. 1862).

Ithomiopsis, Felder, Wien. ent. Monats. p. 411 (Dec. 1862).

1. I. AURANTIACA, Bates, Tr. L. S. xxiii. p. 541.

Hab. Amazons.

2. I. STALACHTINA, Bates, Tr. L. S. xxiii. p. 541.

Hab. Amazons.

3. I. HELICONINA, Bates, Tr. L. S. xxiii. p. 542.

Hab. Amazons.

4. I. MIMICA, Bates, Tr. L. S. xxiii. p. 542.

Hab. Amazons.

5. I. CORENA, Feld. Wien. ent. Monats. 1862, p. 412.

Hab. Maracáibo.

6. I. SATELLITES, Bates, Tr. L. S. xxiii. p. 542.

Hab. R. Tapajos.

7. I. ASTRÆA, Felder, Wien. ent. Monats. 1862, p. 412.

Hab. Bogotá.

Genus OREAS.

Oreas, Felder, Reise der Novara, Zool. ii. 2. p. 305.

1. O. MARATHON, Felder, l. c. p. 105, t. xxxviii. f. 23, 24.

Hab. Bogotá.

2. O. CTESIPHON, Felder, l. c. p. 305.

Hab. Bogotá.

Genus ISAPIS.

Isapis (Dbldy.), Westw. in D. W. & H. Gen. D. L. p. 465.

1. I. AGYRTUS, Cram. pl. 183. f. B, C; D. W. & H. pl. 72. f. 5.

Hab. Surinam, Amazons.

Genus LEPRICORNIS.

Lepricornis, Felder, Reise der Novara, Zool. ii. 2. p. 307.

1. L. MELANCHROIA, Feld. l. c. p. 307, t. xxxviii. f. 25.

Hab. Mexico.

Genus CHAMÆLIMNAS.

Chamælimnas, Felder, Reise der Novara, Zool. ii. 2. p. 304.

1. CH. ÆRIS, n. s., *suprà*, p. 378.

Hab. Upper Amazons.

2. CH. BRIOLA, n. s., *suprà*, p. 379.

Hab. Ucayali, Amazons.

3. CH. TIRCIS, Feld. l. c. p. 304, t. xxxv. f. 17, 18, ♂ ♀.

Hab. Bahia.

Genus SYRMATIA.

Syrmatia (Hüb.), Westw. in D. W. & H. Gen. D. L. p. 426.

1. S. DORILAS, Cramer, pl. 48. f. C ; D. W. & H. Gen. D. L. pl. 70. f. 3.
Nyx, Hübn. Samml. exot. Schm. i.
Hab. Brazil.
2. S. ASTERIS, G. R. Gray, Griffith's An. K. Ins. pl. 102. f. 2.
Hab. Brazil.
3. S. LAMIA, n. s., *suprà*, p. 379.
Hab. Upper Amazons.

Genus BARBICORNIS.

- Barbicornis*, Godart, Enc. Méth. ix. p. 705.
1. B. BASILIS, Godt. Enc. Méth. ix. p. 706 ; Bdv. Sp. Gén. pl. 20. f. 3.
Hab. Brazil.
 2. B. MONA, Hewits. in D. W. & H. Gen. D. L. pl. 70. f. 2.
Hab. — ?

Genus MONETHE.

- Monethe*, Westw. in D. W. & H. Gen. D. L. p. 462.
1. M. ALPHONSUS, Fab. E. S. iii. 1. 308. 171.
Hab. Brazil.
 2. M. ALBERTUS, Felder, Wien. ent. Monats. 1862, p. 73.
Hab. Amazons, Upper Rio Negro.

Genus ORESTIA.

- Orestia*, Felder, Wien. ent. Monats. 1862, p. 73.
1. O. VITULA.
Limnas vitula, Hewits. Exot. Butt. Lim. f. 5.
Hab. Upper Amazons.
 2. O. TAPAJONA, n. s., *suprà*, p. 381.
Hab. Tapajos, Amazons.

Genus METAPHELES.

- Metapheles*, Bates, Entom. Monthly Mag. iii. p. 155.
1. M. DINORA, Bates, Ent. M. M. iii. p. 155.
Hab. Veragua.

Genus TMETOGLENE.

- Tmetoglène*, Feld. Wien. ent. Monats. 1862, p. 235 ; Reise der Novara, Zool. ii. 2. p. 306 (1865).
Brachyglenis, Felder, Wien. ent. Monats. 1862, p. 73 (nom. præocc.).
1. T. ESTHEMA, Feld. W. ent. M. 1862, p. 73 ; Reise der Novara, Zool. p. 306, pl. xxxviii. f. 15, 16.
Hab. Upper Rio Negro.

Genus ESTHEMOPSIS.

Esthemopsis, Reise der Novara, Zool. ii. 2. p. 306.

Pseudopheles, Bates, Tr. Ent. Soc. v. 3rd ser. p. 544.

1. E. CLONIA, Felder, Reise der Novara, Zool. ii. 2. p. 306, pl. xxxviii. f. 15, 16.

Hab. Upper Rio Negro, Bogotá.

2. E. ALICIA, Bates, Entom. Monthly Mag. i. p. 203 (*Pheles Alicia*).

Hab. Guatemala.

3. E. SERICINA.

Pseudopheles sericina, Bates, Trans. Ent. Soc. 3rd ser. vol. v. p. 544.

Hab. Maranhão, Pará, Upper Amazons.

4. E. CELINA, n. s., *suprà*, p. 379.

Hab. Ega.

5. E. LITHOSINA, n. s., *suprà*, p. 380.

Hab. Tunantins, Upper Amazons.

6. E. ÆOLIA, n. s., *suprà*, p. 380.

Hab. Tapajos.

B. *Antennæ ringed or spotted with grey, fore-wing subcostal emitting its second branch before the end of the cell*.*

a. *Palpi not projecting beyond the forehead.*

Genus SISEME.

Siseme, Westwood in D. W. & H. Gen. D. L. p. 462.

1. S. ARISTOTELES, Latr. in Humboldt & Bonpl. Zool. p. 243. pl. 24. f. 5, 6.

Hab. New Granada.

2. S. PALLAS, Latr. Humb. & Bonpl. Zool. p. 244, pl. 24. f. 7, 8.

Hab. New Granada.

3. S. NEURODES, Felder, Wien. ent. Monats. 1861, p. 98; 1862, p. 71, ? var. *Pallas*.

Hab. Venezuela, Ecuador, Peru, Upper Rio Negro.

4. S. MINERVA, Felder, Reise der Novara, Zool. ii. 2. 308, t. xxxvi. f. 14, 15.

Hab. New Granada.

5. S. XANTHOGRAMMA, n. s., *suprà*, p. 384.

Hab. E. Peru.

6. S. SPRUCEI, n. s., *suprà*, p. 384.

Hab. Ecuador.

* Except in *Helicopsis Cupido*.

7. *S. CAUDALIS*, n. s., *suprà*, p. 384.

Hab. E. Peru.

8. *S. ALECTRYO*, Westw. D. W. & H. Gen. D. L. p. 463, pl. 72. f. 10.

Hab. New Granada.

Genus RIODINA.

Riodina, Westwood, D. W. & H. Gen. D. L. p. 430.

1. *R. LYSIPPUS*, Linn. S. N. ii. 793. 250; Clerck, Icones, t. 22. f. 3, 4;
Cramer, pl. 380. f. A.

Hab. Guiana, Amazons.

Genus AMARYNTHIS.

Amarynthys (Hübner), Westwood, D. W. & H. Gen. D. L. p. 443.

1. *A. MENERIA*, Cram. pl. 94. f. D, E; D. W. & H. pl. 70. f. 7, ♂ (1779).

Mæcenus, Fab. E. S. iii. 1. 306. 160 (1793).

Micalia, Cram. pl. 94. f. F, ♀.

Hab. Surinam, Amazons.

2. *A. HYPOCHALYBE*, Felder, Wien. ent. Monats. 1861, p. 98; Reise
der Novara, Zool. ii. 2. p. 293, t. xxxvii. f. 21, 22.

Hab. Bogotá.

Genus ZELOTÆA, n. g., *suprà*, p. 381.

1. *Z. PHASMA*, n. s., *suprà*, p. 382.

Hab. Upper Amazons.

2. *Z. DUBIA*, n. s., *suprà*, p. 382.

Hab. Pará.

3. *Z. ACHROA*, n. s., *suprà*, p. 382.

Hab. Tapajos, Amazons.

Genus DYSMATHIA, n. g., *suprà*, p. 382.

1. *D. PORTIA*, n. s., *suprà*, p. 383.

Hab. Pará.

2. *D. COSTALIS*, n. s., *suprà*, p. 383.

Hab. Upper Amazons.

3. *D. AREUTA*.

Pandemos Areuta, D. W. & H. Gen. D. L. pl. 70. f. 5.

Hab. Pernambuco.

Genus HELICOPIS.

Helicopis (Fabr. Syst. Gloss.), Westwood, D. W. & H. Gen. D. L.
p. 423.

1. *H. ENDYMION*, Cram. pl. 244. f. C, D, E, F (1782).

Gnidus, Fab. Mant. ii. 607. 64 (1787); (transformations) Stoll,

Suppl. Cram. pl. 4. f. 5.

Hab. Surinam, Amazons.

2. H. SELENE, Felder, Reise der Novara, Zool. ii. 2. p. 289.

Hab. Surinam.

3. H. CUPIDO, Linn. S. N. ii. 787. 217; Roesel, Ins. Bel. iv. t. 3. f. 7;
Cramer, pl. 164. f. D, E, F, G; (transformations) Stoll, Suppl. Cram.
pl. 4. f. 6.

Hab. Surinam, Amazons.

Genus ANTEROS.

Anteros (Hübner), Westw. D. W. & H. Gen. D. L. p. 427.

1. A. CHRYSUS, Cram. pl. 380. f. D, E (fig. bad).

Hab. Surinam, Amazons.

2. A. DEMATRIA, D. W. & H. Gen. D. L. pl. 71. f. 10.

Local var. of *Chrysus*?

Hab. Honduras.

3. A. ACANTHOIDES.

Nymphidium acanthoides, Herr.-Schäff. Exot. Schm. f. 49, 50.

Hab. Amazons.

4. A. GYAS, Cramer, pl. 28. f. F, G.

Acanthus, Cramer, pl. 380. f. K, L (dark var.).

Charis Acanthus, Westw. D. W. & H. Gen. D. L. p. 453.

Charis Gyas, id.

Hab. Surinam, Amazons.

5. A. CARAUSIUS, Westw. D. W. & H. Gen. D. L. p. 428; Hew. Exot.

Butt. *Anteros*, f. 3, 4.

Hab. Mexico.

6. A. AXIOCHUS, Hewits. Exot. Butt. *Anteros*, f. 1, 2.

Hab. Brazil.

7. A. RENALDUS, Stoll, Suppl. Cram. t. 13. f. 1, 1a (fig. bad in outline); D. W. & H. pl. 70. f. 6.

Hab. Surinam, Brazil, Amazons.

8. A. AMPYX, Drury, Ill. iii. pl. 9. f. 2, 3.

Hab. Rio Janeiro.

9. A. ACHÆUS, Cram. pl. 352. f. G, H (tails exaggerated).

Hab. Surinam, Amazons.

10. A. BRACTEATA, Hewits. Exot. Butt. *Anteros*, f. 11, 12, ♂ ♀.

Hab. Amazons.

11. A. FORMOSUS, Cramer, pl. 118. f. G (1779).

Valens, Fab. Mant. ii. 644. 67 (1787).

Formosus, Fab. l. c. 632.

Valens, Perty, Del. Anim. Art. Bras. pl. 30. f. 3, 3b.

Hab. Surinam, Amazons.

12. A. CHRYSOPRASTA (Bates), Hewits. Exot. Butt. Anteros, f. 7, 8.
Hab. Amazons.
13. A. ALLECTUS, Westw. D. W. & H. Gen. D. L. p. 428; Hewits. Exot.
 Butt. Anteros, f. 5, 6.
Hab. Amazons.
14. A. OTHO, Westw. D. W. & H. Gen. D. L. p. 428; Hewits. Exot.
 Butt. Anteros, f. 9, 10.
Hab. Amazons.

Genus PARNES.

- Parnes* (Dbldy.), Westw. D. W. & H. Gen. D. L. p. 464.
1. P. NYCTEIS (Bdv.), Westw. D. W. & H. Gen. D. L. p. 464, pl. 73.
 f. 3.
Hab. Amazons.
2. P. PHILOTES (Dbldy.), Westw. D. W. & H. Gen. D. L. p. 464.
Hab. Amazons.

Genus EMESIS.

- Emesis* (Fabr. Syst. Gloss.), Westw. D. W. & H. Gen. D. L. p. 446.
Nimula, Blanch. Anim. Art. iii. p. 465 (nec *Nymula*, Bdv.).
1. E. LUCINDA, Cram. pl. 1. f. E, F, ♂; Fab. Mant. ii. 319. 30, ♂.
Dyndima, Cram. pl. 271. f. G, H, ♀.
Hab. Surinam, Amazons.
2. E. FASTIDIOSA, Ménétr. Cat. St. Petersb. p. 90, pl. iii. f. 5.
Hab. Rio Janeiro.
3. E. SPRETA, n. s., *suprà*, p. 385.
Hab. Upper Amazons.
4. E. TENEDIA, Felder, Wien. ent. Monats. 1861, p. 99.
Hab. Venezuela, New Granada, Guatemala.
5. E. CYPRIA, Feld. Wien. ent. Monats. 1861, p. 99: Reise der No-
 vara, Zool. ii. 2. p. 293, t. xxxvi. f. 12, 13.
Hab. Venezuela, New Granada.
6. E. OCYPORE, Hübn. Zutr. f. 989-990, ♂.
Hab. "Africa" (?).
7. E. HYPOCHLORIS, n. s., *suprà*, p. 385.
Hab. Upper Amazons.
8. E. MANDANA, Cram. pl. 271. f. E, F (1782).
Arminius, Fab. E. S. iii. 1. 478. 155 (1723).
Ops, Latr. Humb. & Bonpl. Zool. vol. ii. pl. 27. f. 3, 4.
Hab. Surinam, Amazons, New Granada.
9. E. TOLTECA, Reakirt, Proc. Ac. Sci. Philadelph. 1866, p. 248.
Hab. Mexico.

10. E. AURELIA, Bates, Trans. Ent. Soc. 3rd. ser. vol. v. p. 544.
Hab. Maranham, interior.

11. E. ÆTHALIA, Bates, *suprà*, p. 385.
Hab. Santa Martha, New Granada.

12. E. FATIMELLA, Westw. D. W. & H. Gen. D. L. p. 447.
Fatima, Cram. pl. 271. f. C, D.
Hab. New Granada.

13. E. DIOGENIA, Prittwitz, Stettin. ent. Zeit. 1865, p. 314.
Hab. Brazil.

Genus SYMMACHIA.

Symmachia (Hübner), Westw. D. W. & H. Gen. D. L. p. 444.
Caria, Hbn., Erichs.

Synapta, Felder, Reise der Novara, Zool. ii. 2. p. 294.

1. S. FATIMA, Cram. pl. 271. f. A, B (1782).
Ovidius, Fab. E. S. iii. 1. 320. 212 (1793); D. W. & H. Gen. D. L.
 pl. 72. f. 6.

Hab. Surinam, Amazons.

2. S. EMESIA, Hewits. Exot. Butt. Sym. f. 7.
Hab. Nicaragua.

3. S. ARGIOPE, Godt. Enc. Méth. ix. 573. 44 (1819).
Caria Colubris, Hübner. Zutr. f. 251, 252 (1823).
Paridion, Dalm. Anal. Ent. p. 44 (1823).

Hab. Bahia, Brazil.

4. S. AMAZONICA, n. s., *suprà*, p. 393.
Hab. Upper Amazons.

5. S. MANTINEA, Feld. Wien. ent. Monats. 1861, p. 99, ♀.
Hab. Ecuador.

6. S. ARETE, Feld. Wien. ent. Monats. 1861, p. 98, ♂.
Hab. Ecuador.

7. S. PLUTARGUS, Fab. E. S. iii. 1. 325. 234; Donovan, Ins. India,
 pl. xlviii. f. 3.
Hab. — ?

8. S. CASTALIA, Ménétr. Cat. St. Pétersb. p. 89, pl. iii. f. 4.
Hab. Brazil.

9. S. GALBULA, Feld. Wien. ent. Monats. 1861, p. 99.
Hab. Caraccas.

10. S. TROCHILUS.

Caria trochilus, Erichs. Schomburgk's Reise, Brit. Gui. iii. p. 601, ♀.
Hab. British Guiana, Upper Amazons.

11. S. DOMITIANUS, Fab. E. S. iii. 1. 315. 193.

Hab. New Granada (mouth of Magdalena), Nicaragua, Guadeloupe.

12. *S. ARGUATA*, Hewits. Exot. Butt. Sym. f. 1.
Hab. Amazons (*Wallace*).
13. *S. PRAXILA* (Dblady.), D. W. & H. Gen. D. L. pl. 73. f. 1, ♀.
Hab. Rio Janeiro.
14. *S. ACCUSATRIX*, Westw. D. W. & H. Gen. D. L. p. 445, ♂ ♀.
Hab. Amazons.
15. *S. PROBETOR*, Cram. pl. 390. f. I, ♂.
Hab. Surinam, Amazons.
16. *S. CALLISTE* (Bates), Hewits. Exot. Butt. Sym. f. 9.
Hab. Pará.
17. *S. ARION*.
Synapta Arion, Felder, Reise der Novara, Zool. ii. 2. p. 294,
t. xxxvi. f. 20, 21.
Hab. —?
18. *S. MENETAS*, Drury, Ill. iii. pl. 8. f. 3 (1783).
Menetes, Stoll, Suppl. Cram. pl. 30. f. 4 (1791)?
Tacitus, Fab. E. S. iii. 1. 308. 168 (1793).
Hab. South Brazil.
19. *S. RUBINA*, Bates, Entom. Monthly Mag. iii. p. 155.
Hab. Panamá.
20. *S. TIGRINA* (Bates), Hewits. Exot. Butt. Sym. f. 2.
Hab. Pará.
21. *S. HETÆRINA* (Bates), Hewits. Exot. Butt. Sym. f. 10.
Hab. R. Tapajos.
22. *S. PARDALIS* (Bates), Hewits. Exot. Butt. Sym. f. 11.
Hab. St. Paulo, Upper Amazons.

Genus CRICOSOMA.

- Cricosoma*, Felder, Reise der Novara, Zool. ii. 2. p. 292.
1. *C. HIPPEA*.
Symmachia Hippea, Herr.-Schäff. Exot. Schm. p. 77. f. 39, 40.
Hab. Amazons.
 2. *C. LEOPARDINUM*, Felder, Reise der Novara, Zool. ii. 2. p. 293.
t. xxxvii. f. 29, 30.
Local var.? *Symmachia Hilaria* (Bates), Hewits, Exot. Butt. Sym. f. 5.
Hab. Bahia, Amazons.
 3. *C. CALLIGRAPHUM*.
Symmachia Calligrapha (Bates), Hew. Exot. Butt. Sym. f. 3.
Hab. Ega, Amazons.

4. C. NORINA.

Symmachia Norina (Bates), Hew. Exot. Butt. Sym. f. 4.*Hab.* R. Tapajos, Amazons.5. C. ERASTE, n. s., *suprà*, p. 385.*Hab.* Upper Amazons.6. C. PHÆDRA, n. s., *suprà*, p. 386.*Hab.* Tapajos, Amazons.

Genus MESENE.

Mesene (Bdv.), West. D. W. & H. Gen. D. L. p. 441.1. M. SOPHISTES, n. s., *suprà*, p. 386.*Hab.* Amazons.

2. M. CINGULUS, Stoll, Suppl. Cram. pl. 13. f. 4.

Bæotis Cingulus, Westw. D. W. & H. Gen. D. L. p. 452.*Hab.* Surinam, Amazons.

3. M. ÆROPE.

Bæotis Ærope, Westw. D. W. & H. Gen. D. L. pl. 71. f. 2, ♂.*Hab.* Amazons.

4. M. NUMITOR, Fab. E. S. iii. l. 324. 228; Donovan. Ins. India, pl. 44. f. 3.

Hab. "Indies."5. M. FULIGINEA, n. s., *suprà*, p. 386.*Hab.* Lower Amazons.6. M. PYRSODES, n. s., *suprà*, p. 386.*Hab.* Upper Amazons.

7. M. BOMILCAR, Stoll, Suppl. Cram. pl. 39. f. 3, ♂.

Hab. Surinam, Amazons.

8. M. PHAREUS, Cram. pl. 170. f. C (1779); Fab. Mant. ii. 722. 79; Hübn. Samml. exot. Schmett. i.

Hab. Surinam, Amazons.

9. M. RUBEELLA, Bates, Entom. Monthly Mag. i. p. 204.

Hab. Panamá.

10. M. CROCEELLA, Bates, Entom. Monthly Mag. i. p. 204.

Hab. Guatemala.11. M. LEUCOPHRYS, n. s., *suprà*, p. 387.*Hab.* Amazons.

12. M. HYA (Bdv.), D. W. & H. Gen. D. L. pl. 70. f. 9, ♂.

? *Emesis monostigma*, Erichs. Schomb. Reise Brit. Gui. iii. p. 601.*Hab.* Amazons.

13. M. HYALE, Felder, Reise der Novara, Zool. ii. 2. p. 292.

Hab. Bogotá.

14. M. PARAENA, n. s., *suprà*, p. 387.
Hab. Pará.
15. M. FENESTRELLA, n. s., *suprà*, p. 387.
Hab. Upper Amazons.
16. M. MARGARETTA, White, Zoologist, 1843, p. 28.
Semiradiata, Felder, Reise der Novara, Zool. ii. 2. p. 292. t. xxxvii.
f. 27, 28.
Hab. Bogotá, Honduras.
17. M. THELEPHUS, Cram. pl. 66. f. E, F, ♂ (1776).
Telephus, Fab. Mant. ii. 78. 710 (1787). *Alphæa*, Hübn. Samml.
exot. Schmett. i. *Timandra*, Godt. Enc. Méth, ix. 583, 100.
Hab. Surinam, Cayenne, Amazons.
18. M. ARGENTEA, Bates, Entom. Monthly Mag. iii. 154.
Hab. Guatemala.
19. M. SIMPLEX. n. s., *suprà*, p. 387.
Hab. Pará.
20. M. CELETES, n. s., *suprà*, p. 387.
Hab. Pará.
21. M. NOLA, Herr.-Schäff. Exot. Schm. p. 77. f. 23.
Hab. Amazons.
22. M. EUPTERYX, n. s., *suprà*, p. 389.
Hab. Pará.
23. M. NYDIA, n. s., *suprà*, p. 389.
Hab. Upper Amazons.
24. M. PYRRHA, n. s., *suprà*, p. 389.
Hab. Upper Amazons.
25. M. EPAPHUS, Cramer, pl. 335. f. D, E.
Hab. Surinam, Amazons.
26. M. EPALIA, Hübn. Zutr. f. 921, 922, ♂.
? *Epalia*, Godt. Enc. Méth. ix. 588. 116.
Hab. Brazil.
27. M. SAGARIS, Cram. pl. 83. f. D, ♂.
♀ *Satnius*, Dalman, Anal. Ent. p. 45.
Episatnius, Prittwitz, Stettin. ent. Zeit. 1865, p. 313.
Hab. Guiana, Amazons, Brazil.
28. M. TRICOLOR.
Symmachia tricolor (Bates), Hew. Exot. Butt. Sym. f. 6.
Hab. Ega.
29. M. NIGROCINCTA, Scheller, Papill. de Surinam, pl. 106 (fig. bad).
Hab. Surinam.

30. *M. BASILISSA*, n. s., *suprà*, p. 388.

Hab. Pará.

31. *M. DEBILIS*, n. s., *suprà*, p. 388.

Hab. Tapajos, Amazons.

32. *M. APOLECTA*, n. s., *suprà*, p. 388.

Hab. Tapajos, Amazons.

33. *M. CROCOSTIGMA*, n. s., *suprà*, p. 388.

Hab. Upper Amazons.

Genus *PACHYTHONE*, n. g., *suprà*, p. 389.

1. *P. EREBIA*, n. s., *suprà*, p. 390.

Hab. Ega, Amazons.

2. *P. LATERITIA*, n. s., *suprà*, p. 390.

Hab. Tapajos and Ega, Amazons.

3. *P. DISTIGMA*, n. s., *suprà*, p. 390.

Hab. Pará.

4. *P. XANTHE*, n. s., *suprà*, p. 391.

Hab. Ega, Amazons.

5. *P. MIMULA*, n. s., *suprà*, p. 391.

Hab. Santarem, Amazons.

Genus *CALYDNA*.

Calydna (Dbldy.) Westw. D. W. & H. Gen. D. L. p. 436.

* *Eyes naked.*

1. *C. ARGIELLA*, n. s., *suprà*, p. 394.

Hab. Brazil.

2. *C. TINEA*, n. s., *suprà*, p. 394.

Hab. Pará.

3. *C. MACULOSA*, n. s., *suprà*, p. 394.

Hab. St. Paulo, Amazons.

4. *C. THERSANDER*, Cram. pl. 335. f. A, B.

Hab. Surinam, Amazons.

5. *C. CEA*, Hewits. Exot. Butt. Cal. f. 16, 17.

Hab. Amazons,

6. *C. EUTHRIA* (Dbldy.), D. W. & H. Gen. D. L. pl. 70. f. 10, ♀.

Hab. Honduras.

7. *C. MICRA*, n. s., *suprà*, p. 395.

Hab. Tapajos, Amazons.

8. *C. STURNULA*, Hübn. Zutr. f. 995, 99, 6, ♀.

Hab. Brazil, Amazons.

9. C. HIRIA, Godt. Enc. Méth. ix. 584. 95, ♂.
Calitas, Hew. Exot. Butt. Cal. f. 7, ♂.
Hab. Brazil, Amazons.
10. C. LUSCA, Hübn. Samml. exot. Schm. iii.
Hab. Brazil.
11. C. CATANA, Hewits. Exot. Butt. Cal. f. 15.
Hab. Amazons.
12. C. CABIRA, Hewits. Exot. Butt. Cal. f. 5, 6.
Hab. Amazons.
13. C. CARNEIA, Hewits. Exot. Butt. Cal. f. 13, 14.
Hab. Amazons.
14. C. CALYCE, Hewits. Exot. Butt. Cal. f. 18.
Hab. Amazons.
15. C. CANDACE, Hewits. Exot. Butt. Cal. f. 19, 20.
Hab. Amazons.
16. C. CAPRINA, Hewits. Exot. Butt. Cal. f. 8.
Hab. Amazons.
17. C. CHARILA, Hewits. Exot. Butt. Cal. f. 9, 10.
Hab. Amazons.
18. C. CAIETA, Hewits. Exot. Butt. Cal. f. 1, 2.
Hab. Amazons.
19. C. CALAMISA, Hewits. Exot. Butt. Cal. f. 3, 4.
Hab. Amazons.

** *Eyes hairy.*

20. C. CHASEBA, Hewits. Exot. Butt. Cal. f. 8.
Hab. Amazons.
21. C. PUNCTATA, Feld. Wien. ent. Monats. 1861, p. 98; Reise der Novara, Zool. ii. 2. p. 291, t. xxxvi. f. 18, 19.
Hab. Ecuador.
22. C. CASTANEA, Prittwitz, Stettin. ent. Zeit. 1865, p. 312.
Hab. S. Brazil.

Genus CHARIS.

Charis (Hübn.), Westw. D. W. & H. Gen. D. L. p. 452.

* *Eyes hairy.*

1. C. MONOGRAMMA, n. s., *suprà*, p. 391.
Hab. Santarem, Amazons.
2. C. CADMEIS, Hew. Exot. Butt. Char. f. 1.
Hab. Amazons.
3. C. LYPERA, n. s., *suprà*, p. 392.
Hab. Ega, Amazons.

4. *C. CHAONITIS*, Hew. Exot. Butt. Char. f. 7, 8.
Hab. Amazons.
5. *C. CLEODORA*, Godt. Enc. Méth. ix. 573. 43.
Hab. Brazil.
6. *C. HERMODORA*, Feld. Wien. ent. Monats. 1861, p. 99.
Hab. Venezuela.
7. *C. CHELONIS*, Hew. Exot. Butt. Char. f. 9.
Hab. Rio Janeiro.
8. *C. THEODORA*, Feld. Wien. ent. Monats. 1862, p. 72; Reise der Novara, Zool. ii. 2. p. 295, t. xxxvi. f. 22, 23, ♂.
Hab. Upper Rio Negro, Amazons.
9. *C. ZAMA*, n. s., *suprà*, p. 392.
Hab. Amazons, Brazil, Guiana, Central America.
10. *C. AVIUS*, Cram. pl. 92. f. B; Godt. Enc. Méth. ix. 573. 41.
Hab. Guiana, Brazil.
11. *C. CLEONUS*, Cram. pl. 380. f. H, I, ♂.
Hab. Guiana.
12. *C. CARYATIS*, Hew. Exot. Butt. Char. f. 6, ♂.
Cleonus, Godt. Enc. Méth. ix. 573. 42.
Hab. Amazons.
13. *C. GYNÆA*, Godt. Enc. Méth. ix. 573. 40.
Hab. Brazil.
14. *C. JESSA*.
Nymphidium Jessa, Bdv. Sp. Génér. pl. 6. f. 10.
Hab. Brazil.
15. *C. CÆCIAS*, Hew. Exot. Butt. Char. f. 2.
Hab. Upper Amazons.
16. *C. ARGYREA*, n. s., *suprà*, p. 392.
Hab. Ega, Amazons.
17. *C. CADYTIS*, Hew. Exot. Butt. Char. f. 3.
Hab. Rio Grande.
18. *C. OCELLATA*.
Symmachia ocellata, Hew. Exot. Butt. Sym. f. 8.
Hab. Venezuela.
19. *C. ? PHERETIMA*.
Crocozona Pheretima, Felder, Reise der Novara, Zool. ii. 2. p. 296.
t. xxxvi. f. 16, 17, ♂.
Hab. Bogotá.

** *Eyes naked.*

20. *C. AZORA*, Godt. Enc. Méth. ix. 572. 39.
Hab. Brazil.

21. *C. CALICENE*, Hew. Exot. Butt. Char. f. 4, 5, ♀.
? ♀ *Azora*, Godt.
Hab. —?.
22. *C. NILUS*, Feld. Wien. ent. Monats. 1861, p. 100.
Hab. Venezuela.
23. *C. CÆNEUS*, Linn. S. N. ii. 796. 273.
Virginienis (Bdv.), Guér. Icon. R. A. t. 81. f. 1.
Nymphidia pumila, Bdv. & Lec. Icon. Léop. Am. Sept. t. 37. f. 6, 7.
Hab. United States.
24. *C. ARGYRODINES*, Bates, Entom. M. Mag. iii. p. 154.
Hab. Guatemala, Nicaragua.
25. *C. VENILIA*, n. s., *suprà*, p. 393.
Hab. Tapajos and Pará.
26. *C. PERONE* (Dbldy.), D. W. & H. Gen. D. L. p. 453, pl. 71. f. 9.
Stilbe, Godt. Enc. Méth. ix. 574. 47?
Hab. Amazons.
27. *C. TROCHILIA*.
Bæotis trochilia, Westw. D. W. & H. Gen. D. L. p. 452.
Hab. Amazons.
28. *C. GLAUCOPIS*, n. s., *suprà*, p. 393.
Hab. Ega.
- 29? *C. EPIJESSA*, Prittwitz, Stettin. ent. Zeit. 1865, p. 315, ♂.
Hab. S. Brazil.

b. *Palpi projecting beyond the forehead.*

Genus *BÆOTIS* (Hbn.), *suprà*, p. 395.

1. *B. HISBON*, Cramer, pl. 83. f. C (1775); Westw. D. W. & H. Gen. D. L. p. 452.
Hab. Guiana, Amazons.
2. *B. EUPREPES*, n. s., *suprà*, p. 396.
Hab. Tapajos, Amazons.
3. *B. MELANIS*, Hübn. Zutr. f. 427, 428.
Hab. Brazil.
4. *B. PRIMA*, n. s., *suprà*, p. 396.
Hab. Tapajos and Upper Amazons.

Genus *METACHARIS*.

Metacharis, Butler, Entom. Monthly Mag. iii. p. 174.

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1. *M. PTOLOMÆUS*, Fab. E. S. iii. 1. 319. 209, ♂; Donovan. Ins. Ind. pl. 46. f. 6.
Lemonias Ptolomæus, Westw. D. W. & H. Gen. D. L. p. 459.

Lucius, Fab. E. S. iii. 1. 320, 211, ♀.

Hab. S. Brazil.

2. *M. AGRIUS*, Dalm. Anal. Ent. p. 46. n. 18.

Charis sylvestra, Ménétr. Cat. St. Petersb. t. 3. f. 6.

Hab. Brazil.

3. *M. NICASTE*, Herr.-Schäff. Exot. Schm. f. 47, 48, ♂.

M. Batesii, Butler, Ent. M. Mag. iii. p. 175, ♂ ♀.

Hab. Amazons.

4. *M. REGALIS*, Butler, Ent. M. Mag. iii. p. 175.

Hab. Amazons, Brazil.

5. *M. CUPARINA*, n. s., *suprà*, p. 396.

Hab. Tapajos, Amazons.

6. *M. NIGRELLA*, n. s., *suprà*, p. 396.

Hab. Tapajos, Amazons.

** *Echenais*, Hübn.

7. *M. CHIA*, Hübn, Zutr. f. 357, 358.

Hab. Surinam, Amazons.

8. *M. EXIGUA*, n. s., *suprà*, p. 396.

Hab. Tapajos, Amazons.

9. *M. ERYTHROMELAS*, Scheller, Ins. Surinam, pl. 29, ♂ ♀.

Hab. Surinam, Amazons.

Genus *LASAIA*, n. g., *suprà*, p. 397.

1. *L. MERIS*, Cram. pl. 360. f. B, C, ♂.

Agesilas, Latr. in Humb. & Bonpl. Zool. pl. 25, f. 7, 8.

Hab. Central America, New Granada, Guiana, Amazons.

2. *L. CLEADAS*.

Charis Cleadas, Hewits. Exot. Butt. *Charis*, f. 10.

Hab. R. Tapajos, Amazons.

Genus *THAROPS*.

Tharops, Hübn. Verz. p. 109 (1816), Westw. D. W. & H. Gen. D. L. p. 458.

1. *TH. MENANDER*, Cram. pl. 334. f. C, D, ♀ (fig. bad); D. W. & H. Gen. D. L. pl. 71. f. 11, ♂.

Petronius, Fab. E. S. iii. 1, 324, 227?

Hab. Guiana, Amazons (Santarem).

2. *TH. CORUSCANS*, Butler, Proc. L. S. Zool. vol. ix. p. 222.

Hab. Pará.

3. *TH. NITIDA*, Butler, Proc. L. S. Zool. ix. p. 223, pl. vi. f. 20, 21.

Hab. S. Brazil.

4. TH. PRETUS, Cram. pl. 182. f. C, D, ♂.
Hab. Guiana, Amazons.
5. TH. GLAUCOMA, Hübn. Zutr. f. 927, 928, ♂.
Hab. Brazil.
6. TH. SPLENDIDA, Butler, Proc. L. S. Zool. ix. p. 224, pl. vi. f. 24, 25.
Hab. Pará.
7. TH. SUPERBA, n. s., *suprà*, p. 397.
Hab. Amazons.
8. TH. HEBRUS, Cramer, pl. 50. f. E, F.
Ion, Westw. D. W. & H. Gen. D. L. p. 458.
Hab. Guiana, Amazons.
9. TH. CICUTA.
Lemonias Cicuta, Hewits. Exot. Butt. Lem. f. 24, 25, 26. ♂ ♀.
Hab. Amazons.
10. TH. FELSINA, Hewits. Exot. Butt. Lem. f. 27, 28, ♀.
Hab. Rio Janeiro.

Genus LEMONIAS.

Lemonias (Dbldy.), Westw. D. W. & H. Gen. D. L. p. 457.

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1. L. PIONE, n. s. *suprà*, p. 398.
** *Hypophylla*, Bdv. Sp. Gén. pl. 20.
2. L. THARA, Hew. Exot. Butt. Lem. 17, 18, ♂.
Hab. Amazons.
3. L. RHESA, Hew. Exot. Butt. Lem. f. 15, 16, ♂.
Hab. Amazons.
4. L. ZEANGER, Stoll, Suppl. Cram. t. 37. f. 2, 2 B, ♂.
Hab. Surinam.
5. L. CUPREA, Butler, Proc. Linn. Soc. Zool. ix. p. 218, pl. vi. f. 17, 18.
Hab. Amazons.
6. L. PARTHAON, Dalm. Anal. Entom. p. 46, ♂ (1823).
Thermodoë, Geyer in Hübn. Zutr. f. 715, 716, ♂ (1832).
Ancile, Hew. Exot. Butt. Lem. f. 31, ♀.
Hab. Brazil, Amazons.
7. L. RHODOPE, Hew. Exot. Butt. Lem. f. 6, 7, ♂.
Ancile, Hew. Exot. Butt. f. 32, ♀.
Bubo, Butler, Proc. L. S. Zool. ix. p. 217, pl. vi. f. 14, 15, ♂ ♀.
Hab. Amazons.
8. L. ÆMYLIUS, Cram. pl. 66. f. G, H (1776) ♀ ; Fab. Mant. ii. 78. 711 (1787) ♀.
Crispus, Cram. pl. 118. f. D, E (not F) (1779), ♂.
Hab. Guiana, Amazons.

9. L. PSEUDOCRISPUS, Westw. D. W. & H. Gen. D. L. p. 459, ♂.
Crispus, Cram. pl. 118. f. F (not D, E), ♂.
Nepioides, Butler, Proc. L. S. Zool. ix. p. 217, pl. vi. f. 12, 13.
Hab. Guiana, Amazons.
 10. L. MELANOGYRA, Bates.
Luciana, Hübn. Samml. exot. Schm. i. ♂ (nec Fab.).
Hab. Pará.
 11. L. NEPIA (Dbldy.), D. W. & H. Gen. D. L. p. 73. f. 2, ♀.
Nepia, Butler, Proc. L. S. Zool. ix. pl. vi. f. 11, ♂.
Lucianus, Fab. E. S. iii. 1. 313. 185, ♂?
Hab. Venezuela, "Guadeloupe," Fab.
 12. L. BOLENA, Butler, Proc. L. S. Zool. ix. p. 215, pl. vi. f. 8.
Hab. Brazil.
 13. L. CRUENTATA, Butler, Proc. L. S. Zool. ix. p. 221, pl. vii. f. 15.
Hab. Amazons.
 14. L. MARTIALIS, Felder, Reise der Novara, Zool. ii. 2. p. 301.
Hab. Surinam.
 15. L. CEREALIS, Hewits. Exot. Butt. Lem. f. 37, ♀.
 Local(?) var. *Cæcina*, Felder, Reise der Novara, Zool. ii. 2. p. 301.
 t. xxxvii. f. 7, 8.
Hab. Amazons, Bahia.
 16. L. MELIA, n. s., *suprà*, p. 397.
Hab. Amazons.
 17. L. CILISSA, Hew. Exot. Butt. Lem. f. 33, 34, ♂ ♀.
Hab. Nicaragua.
 18. L. ZEURIPE.
Hypophylla Zeurippe, Bdv. Sp. Gén. pl. 20. f. 5.
Hab. Mexico.
 19. L. SUDIAS, Hew. Exot. Butt. Lem. f. 12, 13, 14, ♂ ♀.
Hab. Honduras, Guatemala.
- *** *Calliona*, nobis.
20. L. IRENE, Westw. D. W. & H. Gen. D. L. p. 459, ♂; Hew. Exot.
 Butt. Lem. f. 3, ♂; ♀, Butler, Proc. Linn. Soc. Zool. ix. pl. vii. f. 8.
Hab. Amazons.
 21. L. LATONA, Hew. Exot. Butt. Lem. f. 1, 2, ♂.
Hab. Amazons.
 22. L. SIAKA, Hew. Exot. Butt. Lem. f. 10, 11. ♂; ♀, *suprà*, p. 398.
Hab. Amazons.
- **** *Hamearis* (pt.), Hübn. *Apodemia*, Felder, Butler.
23. L. EPULUS, Cram. pl. 50. f. C, D; Hübn. Samml. i.
Hab. Guiana, Amazons.

24. *L. CAMPESTRIS*, n. s., *suprà*, p. 397.

Hab. Tapajos, Amazons.

25. *L. AURINIA*, Hew. Exot. Butt. Lem. f. 19, 20.

Hab. Amazons.

26. *L. EROSTRATUS* (Bdv.), D. W. & H. Gen. D. L. pl. 71. f. 4.

Hab. Venezuela.

27. *L. CHILENSIS*, Felder, Reise der Novara, Zool. ii. 2. p. 301. t. xxxvii. f. 13, 14.

Hab. Chili.

28. *L. GLAPHYRA*, D. W. & H. Gen. D. L. pl. 71. f. 3.

Hab. S. Brazil.

29. *L. ALBINUS*, Feld. Wien. ent. Monats. 1861, p. 101; Reise der Novara, Zool. ii. 2. p. 299. t. xxxvii. f. 1, 2, 3, 4, ♂ ♀.

Hab. Caraccas: Nova Granada.

30. *L. CALIGINEA*, Butler, Proc. L. S. Zool. ix. p. 226, pl. vii. f. 16.

Hab. Mexico.

31. *L. PULCHERRIMA*, Butler, Proc. L. S. Zool. ix. p. 226, pl. vi. f. 27.

Hab. Nauta, Amazons.

32. *L. MORMO*, Feld. Wien. ent. Monats. 1859, p. 271 n. 19.

Apodemia Mormo, Felder, Reise der Novara, Zool. ii. 2. p. 302, t. xxxvii. f. 15, 16.

Nemeobius dumeti, Behr, Proc. Calif. Ac. Nat. Sci. iii. pt. 3. p. 178 (Jan. 1865).

Hab. Utah, California.

33. *L. VIRGULTI*.

Nemeobius virgulti, Behr, Proc. Calif. Ac. Nat. Sci. iii. pt. 3. p. 178 (Jan. 1865).

Apodemia Sonorensis, Felder, Reise der Novara, Zool. ii. 2. p. 303 (Oct. 1865).

Hab. Los Angeles, Sonora.

34. *L. MEJICANUS*.

Nemeobius Mejicanus, Behr, Proc. Calif. Ac. Nat. Sci. iii. pt. 3. p. 179 (Jan. 1865).

Hab. Sierra Madre, Mazatlan, Mexico.

35. *L. DOMINA*, Bates, Ent. Month. Mag. i. p. 204.

Hab. Panamá.

36. *L. STALACHTOIDES*, Butler, Proc. L. S. Zool. ix. p. 228, pl. vii. f. 18.

Hab. Rio Janeiro.

37. *L. COLCHIS*, Felder, Reise der Novara, Zool. ii. 2. p. 300. t. xxxvii. f. 5, 6; Butler, Proc. L. S. Zool. ix. p. 228, pl. vi. f. 17.

Hab. S. Brazil.

***** *Calospila*, Westw. D. W. & H. Gen. p. 458.

38. L. BORSIPPA, Hewits. Exot. Butt. Lem. f. 35, 36.

Hab. Amazons.

39. L. BORSIPPINA, Butler, L. S. Zool. ix. p. 219. pl. vi. f. 29.

Hab. Tapajos, Amazons.

40. L. SENTA, Hewits. Exot. Butt. Lem. f. 4, 5.

Hab. Amazons.

41. L. BALISTA, Hewits. Exot. Butt. Lem. f. 22, 23.

Hab. Amazons.

42. ALECTOR, Hübn. Zutr. f. 927, 928.

Hab. Brazil.

43. L. APOTHETA, n. s., *suprà*, p. 399.

Hab. Brazil.

44. L. GALENA, n. s., *suprà*, p. 398.

Hab. Amazons.

45. L. PENTHEA, Cram. pl. 143. f. E, ♂ (1779).

Pentheus, F. Mant. ii. 82. 734 (1787).

Auseris, Hewits. Exot. Butt. Lem. f. 21, ♀.

Hab. Guiana, Amazons.

46. L. ARISTUS, Stoll, Suppl. Cram. pl. 39. f. 4, 4c, ♀ (1791); D. W. & H. Gen. D. L. pl. 71. f. 12, ♂.

Leucocoryana, Geyer in Hübn. Zutr. f. 915, 916 (1837).

Leucophæa, Hübn. Samml. ii.

Alector ♀, Butl. Proc. L. S. Zool. ix. p. 214. pl. vi. f. 1.

Violacea, Butl. Proc. L. S. Zool. ix. p. 214. pl. vi. f. 2, 3.

Hübneri, Butl. Proc. L. S. Zool. ix. p. 214. pl. vi. f. 4, 5.

Hab. Guiana, Amazons.

47. L. AMINIAS, Hew. Exot. Butt. Lem. f. 29.

Hab. Amazons.

48. L. HEMILEUCA, n. s., *suprà*, p. 399.

Hab. Amazons.

49. L. LAMPROS, n. s. *suprà*, p. 399.

Hab. Amazons.

50. L. ÆMULIUS, Fab. E. S. iii. i. 322. 19; Donovan. Ins. Ind. pl. 44. f. 2.

Desmozona hemixanthe, Felder, Reise der Novara, Zool. ii. 2. p. 294, t. xxxvii. f. 17, 18.

Hab. S. Brazil.

***** *Anatole* (pt.), Hübn.

51. L. ZYGIA, Hübn. Samml. exot. Schm. i.

Caletor, Dalm. Anal. Ent. p. 44.

Epone, Godt. Enc. Méth. 580. 76.

Hab. Venezuela, Lower Amásons, Brazil.

52. *L. EGAENSIS*, Butler, Proc. L. S. Zool. ix. p. 225. pl. vi. f. 28, ♀.
Hab. Ega, Upper Amazons.

53. *L. CHEA*, Hew. Exot. Butt. Lem. f. 38, ♀.
Hab. Amazons.

54. *L. ORPHEUS*.

Cremna Orpheus (Bdv), Westw. D. W. & H. Gen. D. L. p. 456, pl. 71.
 fig. 8.
Hab. Brazil.

***** *Thisbe*, Hübn.

55. *L. BELISE*, Cram. pl. 376. f. E, F, ♂.

Irenæa, Cram. pl. 328. f. C, D, ♀.
Hab. Guiana, Amazons.

56. *L. MOLELA*, Hewits. Exot. Butt. Nymph. f. 23, 24, ♂.
Hab. Amazons.

Genus NYMPHIDIUM.

Nymphidium (Fab. Syst. Gloss.), Westw. D. W. & H. Gen. D. L.
 p. 447.

* *Nymula*, Bdv. Sp. Gén. pl. 20.

1. *N. GNOSIS*, Bdv. Sp. Gén. pl. 20. fig. 4, ♂.

Emesis Gnosis, Westw. D. W. & H. Gen. D. L. p. 447.
Hab. Cayenne.

2. *N. ARCTOS*, Hewits. Exot. Butt. Nymph. f. 1, 2, ♂ ♀.
 ? Var. of *N. Gnosis*, Bdv.

Hab. Amazons.

3. *N. TYTIA*, Cram. pl. 121. f. C, D, ♀ (1779).

Tytius, Fab. Sp. Ins. ii. 240. 52 (1781); Fab. E. S. iii. 1. 147. 48, ♀
 (1793).

Eroe, Hewits. Exot. Butt. Nymph. f. 11, 12, ♀.
Hab. Surinam, Cayenne, Amazons.

4. *N. APAME*, Hewits. Exot. Butt. Nymph. f. 13, 14, ♂, 15, ♀.
Hab. Amazons.

5. *N. PHYLLEUS*, Cram. pl. 63. f. D, E, ♂. ?=*Apame*, Hewits.
Hab. Surinam.

6. *N. ARCHE*, Hewits. Exot. Butt. Nymph. f. 10, ♀.
Hab. Amazons.

7. *N. ORESTES*, Cramer, pl. 282. f. A, B, ♀.
Hab. Surinam, Amazons.

8. *N. SORANUS*, Cram. pl. 353. f. A, B, ♂ (fig. very bad).
Hab. Surinam.

9. N. ODITES, Cram. pl. 11. f. E, F, ♀.

Hab. Surinam.

10. N. ABARIS, Cram. pl. 93. f. C, ♀.

♂. *Lemonias Sperthias*, Felder, Reise der Novara, Zool. ii. 2. p. 297,
t. xxxvii. f. 9, 10.

Hab. Surinam, Amazons.

11. N. PRÆCLARUM, Bates, Entom. M. Mag. iii. p. 156.

Hab. Panamá.

12. N. MYCONE, Hewits. Exot. Butt. Nymph. f. 16, 18, ♂ ♀.

Hab. Nicaragua.

13. N. REGULUS, Fab. E. S. iii. 1. 318. 205 : Donovan. Ins. India, pl. 43.
f. 3.

Bæotis Regulus, Westw. D. W. & H. Gen. D. L. p. 452.

Hab. Brazil, Amazons.

** *Desmozona*, Bdv., Felder,

14. N. SYLVARUM, Bates, Trans. Ent. Soc. 3rd ser. vol. v. p. 545.

Hab. Amazons.

15. N. CHAONIA, Hewits. Exot. Butt. Nymph. f. 6, ♂.

Hab. Amazons.

16. N. MYCEA, Hewits. Exot. Butt. Nymph. f. 19.

Hab. New Granada.

17. N. DORILIS, Bates, Ent. M. Mag. iii. p. 156.

Hab. Panamá.

18. N. PELOPS, Cram. pl. 170. f. F.

Hab. Surinam, Amazons.

19. N. OCHRA, n. s., *suprà*, p. 399.

Hab. Amazons.

20. N. AGLE (Dbldy.), Hewits. Exot. Butt. Nymph. f. 3, ♂.

Hab. Amazons.

21. N. RUBIGO, n. s., *suprà*, p. 401.

Hab. Amazons.

22. N. GELA, Hewits. Exot. Butt. Nymph. f. 9, ♂.

Hab. Amazons.

23. N. CALYCE (Dbldy.), Felder, Wien. ent. Monats. 1862, p. 72.

Hab. Amazons, New Granada, Upper Rio Negro.

24. N. MESOLEUCUM, n. s., *suprà*, p. 401.

Hab. New Granada.

25. N. MOLPE, Hübn. Samml. exot. Schm. i.

Azanoides, Butler, Ent. M. M. iii. 222 (pt.).

Hab. Amazons.

26. N. AZAN, D. W. & H. Gen. D. L. pl. 73. f. 5, ♀.
Lamis, Hübn. Samml. ex. Schm. ii. ♂ ♀.
Hab. Brazil.
27. N. LAMIS, Cram. pl. 335. f. F, G, ♀; Fab. Mant. ii. 78. 714; Ent. Syst. iii. 1. 305. 157.
Hab. Surinam.
28. N. LYSIMON, Stoll, Suppl. Cram. t. 39. f. 1, 1 A, ♂ (1791).
Platea (Bdv.), D. W. & H. Gen. D. L. pl. 73. f. 4, ♂.
Azanoides, Butler, Ent. M. Mag. iii. 222 (pt.).
Hab. Surinam, Amazons, Pernambuco.
29. N. CHIMBORAZIA, n. s., *suprà*, p. 400.
Hab. Ecuador.
30. N. FULMINANS, n. s., *suprà*, p. 400.
Hab. Amazons.
31. N. PHLIASUS, Cram. pl. 192. f. A, B.
Phillone, Godt. Enc. Méth. ix. 574. 50.
Hab. Guiana, Amazons, Brazil.
32. N. LYCORIAS, Hewits. Exot. Butt. Nymph. f. 7, 8, ♂ ♀.
Hab. Honduras, Guatemala.
33. N. CARICÆ, L. Syst. Nat. ii. 792. 244; Clerck, Icones, t. 20. f. 2;
 Cram. pl. 170. f. E; transformations, Scheller, Ins. Surinam, pl. 111.
Hab. Guiana, Amazons.
34. N. ACHEROIS, Bdv. Sp. Gén. pl. 21. f. 1.
Hab. Cayenne, Amazons.
35. N. ERYMANTHUS, Ménétr. Cat. Mus. St. Pétersb. p. 90, t. vi. f. 6.
 ? Local var. of *Acherois*.
Hab. Minas Geraes.
36. N. EPIPLATEA, Butler, Ent. M. M. ii. 222.
Hab. Pernambuco.
37. N. ASCOLIA, Hewits. Exot. Butt. Nymph. f. 4.
Hab. Amazons.
38. N. CACHRYS, Fab. Mant. ii. 715. 78 (1787).
Damon, Stoll, Suppl. Cram. pl. 39. f. 5, 5 D (1791), ♂.
Menalcus, Cram. pl. 390. f. K? (fig. bad).
Onoba, Hewits. Exot. Butt. Nymph. f. 21. ♀?
Hab. Surinam, Cayenne, Amazons.
39. N. CHIONE, Bates, Trans. Ent. Soc. 3rd ser. vol. v. p. 545.
Hab. Pará, Amazons.
40. N. HELIOTIS, n. s., *suprà*, p. 402.
Hab. Amazons.

41. N. EUTRAPELA, n. s., *suprà*, p. 401.

Hab. Amazons.

42. N. KADENII, Felder, Wien. ent. Monats. 1861, p. 101.

Lemonias Kadenii, Felder, Reise der Novara, Zool. ii. 2. p. 302,
t. xxxvii. f. 11, 12.

Hab. Venezuela.

43. N. OMOIS, Hewits. Exot. Butt. Nymph. f. 20.

Hab. Amazons.

44. N. NINIAS, Hewits. Exot. Butt. Nymph. f. 22.

Hab. Amazons.

45. N. MANTUS, Cram. pl. 47. f. F, G; Fab. Mant. ii. 78. 717.

Desmozona Mantus, Bdv. Sp. Gén. pl. 6. f. 11.

Hab. Venezuela, Amazons, Guiana.

46. N. OLINDA, Bates, Ent. M. Mag. i. p. 204.

Hab. Panamá, Amazons.

47. N. BÆOTIA, Hewits. Exot. Butt. Nymph. f. 5.

Hab. Amazons.

48. N. LEUCOSIA, Hübn. Samml. exot. Schm. i.

Hab. Amazons.

Genus EUERYCINA.

Euerycina, Saunders, Trans. Ent. Soc. 2nd ser. v. p. 95, *suprà*, p. 402.

1. EU. CALPHURNIA, Saund. Tr. Ent. Soc. v. p. 221, pl. 20. f. 7, 7 a, ♀;
n. s. v. p. 106, pl. x. f. 8, ♂.

Hab. Amazons.

Genus CATAGRAMMINA, n. g., *suprà*, p. 1.

1. C. TAPAJA, Saunders.

Necyria Tapaja, Saund. Tr. Ent. Soc. n. s. v. p. 108, pl. xi.
f. 17, 18, ♂.

Hab. Amazons.

Genus THEOPE.

Theope (Dbldy.), Westw. D. W. & H. Gen. D. L. p. 439.

1. TH. PIERIDOIDES, Felder, Reise der Novara, Zool. ii. 2. p. 292,
t. xxxvii. f. 19, 20, ♂.

Hab. Bahia.

2. TH. EUDOCIA, D. W. & H. Gen. D. L. pl. 70. f. 4.

Hab. Amazons.

3. TH. PEDIAS, Herr.-Schäff. Exot. Schm. f. 24, 25. ♂.

Thelpusa, Hewits. Exot. Butt. Theo. f. 7, 8, ♀.

Hab. Amazons.

4. TH. HYPOXANTHE, n. s., *suprà*, p. 405.

Hab. Amazons.

5. TH. APHELES, n. s., *suprà*, p. 405.

Hab. Amazons.

6. TH. ZOSTERA, n. s., *suprà*, p. 405.

Hab. Amazons.

7. TH. THOOTES, Hew. Exot. Butt. Theo. f. 9, 10, ♀.

Hab. Amazons.

8. TH. THERITAS, Hew. Exot. Butt. Theo. f. 2, 3, ♂.

Hab. Amazons.

9. TH. SOBRINA, n. s., *suprà*, p. 405.

Hab. Amazons.

10. TH. SERICEA, n. s., *suprà*, p. 404.

Hab. Amazons.

11. TH. EXCELSA, n. s., *suprà*, p. 406.

Hab. Amazons.

12. TH. LAMPROPTERYX, n. s., *suprà*, p. 404.

Hab. Amazons.

13. TH. AUREONITENS, n. s., *suprà*, p. 405.

Hab. Amazons.

14. TH. HYPOLEUCA, n. s., *suprà*, p. 406.

Hab. Amazons.

15. TH. LYCÆNINA, n. s., *suprà*, p. 406.

Hab. Amazons.

16. TH. FOLIORUM, n. s., *suprà*, p. 407.

Hab. Amazons.

17. TH. SIMPLICIA, n. s., *suprà*, p. 406.

Hab. Amazons.

18. TH. LEUCANTHE, n. s., *suprà*, p. 408.

Hab. Amazons.

19. TH. AZUREA, n. s., *suprà*, p. 406.

Hab. Amazons.

20. TH. METHEMONA, n. s., *suprà*, p. 408.

Hab. Amazons.

21. TH. PUNCTIPENNIS, n. s., *suprà*, p. 407.

Hab. Amazons.

22. TH. ATIMA, n. s., *suprà*, p. 407.

Hab. Amazons.

23. TH. TETRASTIGMA, n. s., *suprà*, p. 408.
Hab. Amazons.
24. TH. VIRGILIUS, Fab. E. S. iii. 1. 323. 226.
Hab. "Indiis" Fab. (Honduras?), Nicaragua.
25. TH. CÆRULEA, n. s., *suprà*. p. 408.
Hab. Brazil.
26. TH. NOBILIS, n. s., p. 410.
Hab. Amazons.
27. TH. TERAMBUS, God. Enc. Méth. ix. p. 676. 182 (1819).
Lytaea, Hüb. Zutr. f. 901. 2 (1837).
Hab. Brazil.
28. TH. PUBLIUS, Feld. Wien. ent. Monats. 1861, p. 98.
Hab. Venezuela.
29. TH. BASILEA, Bates, Entom. M. Mag. iii. 1866, p. 155.
Hab. Panamá.
30. TH. SYNGENES, n. s., *suprà*, p. 409.
Hab. Amazons.
31. TH. THEBAIS, Hewits. Exot. Butt. Theo. f. 1, 4, ♂.
Hab. Amazons.
32. TH. THESTIAS, Hewits. Exot. Butt. Theo. f. 5, 6.
Hab. — ?
33. TH. JANUS, Bates, Trans. Ent. Soc. 3rd ser. v. p. 546.
Hab. Maranh.
34. TH. DISCUS, n. s., *suprà*, p. 409.
Hab. Amazons.
35. TH. EURYGONINA, n. s., *suprà*, p. 410.
Hab. Amazons.
36. TH. BAHIANA.
Aricoris Bahiana, Felder, Reise der Novara, Zool. ii. 2. p. 295,
t. xxxviii. f. 3, 4, ♀.
Hab. Bahia.
37. TH. (?) TUTANA, Godt. Enc. Méth. ix. p. 577.
Hab. Brazil.
38. TH. (?) TISIPHONE, Westw. D. W. & H. Gen. D. L. p. 450, pl. 72.
f. 7, ♂.
Hab. Brazil.
39. TH. DREPANA, n. s., *suprà*, p. 409.
Hab. Amazons.
40. TH. PHÆO, Prittwitz, Stettin. ent. Zeit. 1865, p. 312.
Hab. S. Brazil. Ranges near *Theritas*, Hewits.

Genus PANDEMOS.

Pandemos (Hübner), Westw. D. W. & H. Gen. D. L. p. 440.

1. P. ARCAS, Cram. pl. 179. f. E, F (1779); Fab. E. S. iii. l. 157. 483 (1793).

Pasiphaë, Cram. pl. 80. f. E (1776?), ♀?

Hab. Surinam, Amazons.

Genus ARICORIS.

Aricoris (Bdv.), Westw. D. W. & H. Gen. D. L. p. 450 (1851).

Orimba, Herr.-Schäff. Exot. Schm. p. 55 (1856?).

Setabis (Dblady.), Westw. l. c. p. 450.

1. A. EPITUS, Cram. pl. 270. f. C, ♀ (1782).

Butler, Proc. L. S. Zool. ix. pl. vii. f. 10, 12, 14, ♀.

Epigia, Godt. Enc. Méth. ix. p. 577 (1819), ♀.

Orimba cataleuca, Herr.-Schäff. Exot. Schm. p. 55. f. 28, 29 (1856?), ♂.

Hab. Surinam, Amazons.

2. A. SERICA, Westw. D. W. & H. Gen. D. L. p. 450, pl. 72. f. 8, ♀ ;
Butler, Proc. L. S. Zool. ix. pl. vii. f. 13, ♂.

Hab. Amazons.

3. A. LAGUS, Cram. pl. 117. f. F, G, ♂; Fab. E. S. iii. l. 306. 159, ♂.

Polyommatus Lagus, Godt. Enc. Méth. ix. 680, ♂.

Pandemos Lagus, Westw. D. W. & H. Gen. D. L. p. 440, ♂.

Aricoris cyanea, Butler, Proc. L. S. Zool. ix. p. 221, pl. 7. f. 5, ♂.

Er. Pherephatte, Godt. Enc. Méth. ix. p. 590, ♀.

♀ *Limnas Pherephatte*, Westw. D. W. & H. Gen. p. 460.

A. Lagus, ♀, Butler, Proc. L. S. Zool. ix. pl. vii. f. 4.

♀ *Aricoris Petavia*, Felder, Reise der Novara, Zool. ii. 2. p. 295, t. xxxviii. f. 5, 6.

var. ♀ ? *A. inquinata*, Butler, Proc. L. S. Zool. ix. pl. vii. f. 1.

Hab. Surinam, Amazons, Cayenne.

4. A. PYTHIA, Hewits.

Lemonias Pythia, Hewits. Exot. Butt. Lem. f. 8, 9, ♂.

Aricoris myrtis (Dblady.), Westw. D. W. & H. Gen. p. 450, ♀?

Hab. Amazons.

5. A. PYTHIOIDES, Butler.

Lemonias pythioides, Butler, Proc. L. S. Zool. ix. p. 220, pl. vii. f. 3, ♂.

Hab. Ega, Amazons.

6. A. BUTLERI, n. s. *infra*, p. 459.

Hab. Tapajos.

7. A. AMETHYSTINA, Butler.

Lemonias amethystina, Butler, Proc. L. S. Zool. ix. p. 220, pl. vii. f. 7, ♂.

Hab. Tapajos.

8. A. GELASINE, n. s. *suprà*, p. 402, ♂ ♀.

♂ *A. Lagus*, Butler, Proc. L. S. Zool. ix. pp. 220 & 221, pl. vii. f. 2.
Hab. Ega, Amazons.

9. A. DISPARILIS, n. s., *suprà*, p. 403, ♂ ♀.

Hab. Amazons (Tapajos).

10. A. VELUTINA, n. s., *suprà* p. 403, ♂ ♀.

Butler, Proc. Linn. Soc. Zool. ix. pl. vii. f. 11, ♂.

Hab. S. Paulo, Amazons.

11. A. FLAMMULA, n. s., *suprà*, p. 404.

Hab. Amazons.

Genus URANEIS, n. g., *suprà*, p. 411.

1. U. HYALINA.

Tharops hyalina, Butler, Proc. L. S. Zool. ix. pl. vi. f. 26, ♂.

♀, *suprà*, p. 412.

Hab. Amazons.

C. *Palpi projecting beyond the forehead. Antennæ not ringed with white. Median nervures forming an angle at the junction of the discocellulars; the latter, in the hind wing, joining the subcostal at a long distance above its bifurcation. Stalachtinæ.*

Genus STALACHTIS.

Stalachtis, Hübn. Verz. bek. Schmett. p. 27 (1816).

Syn. *Nerias* (Bdv.), Blanch. Anim. Artic. iii. p. 437 (1840).

1. S. PHLEGIA, Cram. pl. 197. f. F (1780?), pl. 236. f. C.

Phlegeus, Fab. Sp. Ins. ii. 127. 577 (1781).

Phlegetonia, Perty, Del. Anim. Art. t. 30. f. 2, ♀.

Hab. Brazil, Amazons, Guiana.

2. S. SUSANNA, Fab. Mant. ii. 16. 166 (1787); Hübn. Zutr. f. 425, 426 (1825); Bdv. Sp. Gén. pl. 11. f. 6.

Mechanitis Meriana, Esch. Kotzeb. Reise, p. 213, pl. viii. f. 19 (1821).

Hab. S. Brazil.

3. S. CALLIOPE, Linn. S. N. ii. 755, 756; Clerck, Icones, t. 41. f. 4; Cramer, pl. 246. f. C.

Hab. Guiana, Amazons.

4. S. EUGENIA, Cram. pl. 133. f. F.

Hab. Surinam.

5. S. MAGDALENA (Bdv.), D. W. & H. Gen. D. L. pl. 73. f. 6.

Hab. New Granada.

6. S. EUTERPE, Linn. S. N. ii. 756. 61; Cram. pl. 246. f. D.

Hab. Guiana, Amazons.

7. S. PHÆDUSA, Hübn. Zutr. f. 13, 14, ♀.

Hab. Pará.

8. S. DUVALII, Perty, Del. Anim. Art. p. 153. pl. 30. f. 1, ♂.

Hab. Upper Amazons.

9. S. ZEPHYRITIS, Dalm. Anal. Ent. p. 47, ♂.

Hab. ——. ? (Cayenne?)

10. S. LINEATA, Guér. Icon. Règne Animal, texte, p. 473.

Hab. Pará.

11. S. MARGARITA, Felder, Reise der Novara, Zool. ii. 2. p. 310.

Hab. Surinam.

Genus incertæ sedis.

ITHOMIOLA.

Ithomiola, Felder, Reise der Novara, Zool. ii. 2. p. 311.

1. I. FLORALIS, Felder, l. c. p. 311.

Hab. Surinam.

Species described by Authors, not at present determinable.

1. ERYCINA EUPOLEMIA, Godart, Enc. Méth. ix. p. 572.

Hab. De l'Amérique.

2. ERYCINA ANAPIS, Godt. Enc. Méth. ix. p. 576.

Hab. Brazil.

3. ERYCINA ISALA, Godt. Enc. Méth. ix. p. 579.

Hab. De l'Amérique Méridionale.

4. P. ARCHIMEDES, Fab. Ent. Syst. iii. 1. 320. 210.

Hab. "Indiis."

Probably a species of *Theope*.

5. PAPILIO ARCHYTAS, Stoll, Suppl. Cram. pl. v. f. 5, 5a.

Hab. Surinam.

6. P. ZACHÆUS, Fab. Ent. Syst. v. Suppl. p. 431.

Hab. Cayenne.

7. P. MISENES, Cramer, pl. 117. f. D.

Hab. Surinam.

Probably a *Lycænide*.

8. P. POLYMENUS, Fab. Ent. Syst. iii. 1. 54. 166.

Hab. Surinam.

9. P. PYGMÆA, Cram. pl. 7. f. A, B.

P. Talus, Fab. Ent. Syst. iii. 1. 318. 202.

Hab. Surinam.

Nothing can be made of Cramer's figure. Fab. describes the underside as the upper, and *vice versâ*.

10. P. CONSTANTIUS, Fab. Ent. Syst. iii. 1. 152. 468.

Hab. ?

11. P. ARIUS, Cram. pl. 31. f. E.

Hab. Surinam.

12. P. PLAUTUS, Fab. E. S. iii. 1. 291. 113.

Hab. "Indiis."

Doubtful if belonging to this family.

13. P. BIBULUS, Fab. Ent. Syst. iii. 1. 307. 163; Don. Ins. Ind. pl. 46. f. 1.

Hab. "Indiis."

14. P. CORNELIUS, Fab. Ent. Syst. iii. 1. 220. 689.

Hab. ?

Probably a *Satyride*.

15. P. ARGENISSA, Stoll, Cram. Suppl. pl. 27. f. 4, 4 c.

Hab. "Caffraria."

16. P. THASUS, Cram. pl. 333. f. I.

Hab. Surinam.

Possibly a bad figure of *Charis Trochilia*, ♀.

The following species, formerly considered Erycinidæ, have been ascertained to belong to other families :—

P. Theanus, Cram. pl. 139. f. F, a Lycænide.

P. Procas, Fab., a Hesperide.

P. Ægon, Fab., a *Melitæa*.

ADDENDA.

14-15. SYMMACHIA JURATRIX, Westw. D. W. & H. Gen. D. L. p. 445.

Hab. Pará.

ARICORIS BUTLERI.

♂. 1" 7^{'''}. Similar to *A. Pythia* (Hewits.) and *A. pythioides* (Butler); differs from the latter chiefly in the absence of the orange spot from the hind wing, beneath. Above blue-black; fore wing with an elongate light-blue spot near the base, traversed by the submedian nervure, and a rounded blue-white spot in the middle, crossed by the second median branch. Hind wing with three narrow light-blue streaks, the innermost reaching to the base. Beneath white, nervures broadly dusky.

♀. 1" 7^{'''}. Dark brown. Fore wing crossed by an orange belt; hind wing with a large white central spot. Beneath the same, but paler; hind wing with a marginal row of triangular white spots, and the nervures pale.

Hab. Tapajos.

Descriptions of fifty New Species of the Genus *Stigmodera*. By EDWARD SAUNDERS, Esq. Communicated by W. W. Saunders, Esq., V.P.L.S.

(With two Plates.)

[Read November 7, 1867.]

THE present paper contains characters and figures of fifty undescribed species of the genus *Stigmodera* from Australia. There still, however, remain a large number of apparently new species requiring description and further study; for, since there is great modification to be observed, both in the form and colouring of many of the species, it is very desirable to obtain long series of those which are closely allied before giving their specific characters.

In the species I now bring forward, I have had this in view, and have described only those which I think will not prove to be varieties of each other, leaving the more doubtful ones till further evidence shall prove the specific value of their characters.

All the species described in this paper are in my own collection.

STIGMODERA MNIZECHII. (Plate IX. fig 1.)

Viridi-nigrescens, thorace nitidissimo; elytris rugulosis, fascia prope apicem sanguinea; subtus nitida.

Dark greenish black. Elytra with a transverse sanguineous band near the apex. Antennæ purple.

Head deeply punctured, with an impressed line between the eyes, covered with short whitish hairs. Thorax, once and two-thirds as broad as long; anterior margin produced, half as long as the base; sides slightly rounded; base with a shallow median lobe; surface shining and smooth, sides largely punctured near the lateral margins, disk with a faintly impressed dorsal line, median basal lobe terminated on each side by a short longitudinal slit. Elytra once and two-thirds as long as wide, sides slightly sinuate above the middle; apex of each elytron somewhat diagonally truncate, outer angle of truncature slightly dentate; disk striate and very largely punctured; as they approach the sides the punctures become confluent, so as to give a rugose appearance, especially on the shoulders. Beneath of thorax, breast, first abdominal segment and legs, punctured, and slightly hairy. The rest of the segments polished, with a slight impression on each of their sides.

Length 15 lines, breadth 7.

Hab. N. W. Australia.

STIGMODERA BONVOULOIRII. (Plate IX. fig. 2.)

Capite thoraceque cyaneis fortiter punctatis et rugulosis, elytris sanguineis duabus maculis cyaneis notatis, subtus cyanea.

Head and thorax black, with cyaneous reflections. Elytra dark red, with just the base, a transverse somewhat semilunar spot starting from the scutellum, its under margin being semicircular, and another larger transverse diamond-shaped spot, midway between it and the apex, cyaneous. Beneath legs and antennæ cyaneous black.

Head deeply punctured. Thorax once and three-quarters as broad as long; anterior margin produced in the centre and at its angles, a little more than half as long as the base; sides rounded, their margins elevated, base with a wide central lobe; disk largely punctured, the punctures larger and closer together on the sides, with a slight dorsal line; basal lobe terminated on each side by a deep small pit. Elytra twice as long as wide, punctured and deeply striate, the striæ becoming irregular on the sides, and the interstices rugose; sides slightly sinuate above the middle; apex largely truncate. Beneath and legs largely punctured, with a few scattered hairs.

Length 16 lines, breadth $5\frac{1}{2}$.

Hab. N. Australia.

STIGMODERA SANGUINEOCINCTA. (Plate IX. fig. 3.)

Capite thoraceque aureo-viridibus; elytris punctato-striatis, flavis, lateribus sanguineis; subtus viridis.

Head and thorax brassy-green. Elytra testaceous, with their lateral margins and apex sanguineous. Beneath and antennæ green.

Head punctured, widely channelled between the eyes, covered with short white hairs. Thorax nearly twice as broad as long; anterior margin slightly elevated, bisinuate, half as long as the base; sides rounded above the middle, thence subparallel to the base, which has a well-defined but shallow lobe; posterior angles acute; surface largely and deeply punctured; disk with a smooth slightly raised dorsal line, and two transverse irregular smooth spaces about one-third of the entire length of the thorax from the anterior margin; these neither touch the sides nor the dorsal line. Elytra nearly twice as long as wide, rather wider than the thorax, punctate striate, sides gradually converging to the apex, which is but slightly pointed. Beneath and legs finely punctured, covered with white hairs.

Length 12 lines, breadth $4\frac{1}{2}$.

Hab. N. Australia.

STIGMODERA AFFINIS. (Plate IX. fig. 4.)

Limbata, C. G. nec Donovan.

Capite thoraceque æreo-viridibus; thoracis marginibus sanguineis; elytris punctato-striatis, flavis, sutura late viridi, marginibus sanguineis; subtus viridis.

This species, so closely allied in general appearance to *Limbata* of Donovan, may be distinguished in the following manner:—

The colour of the head and thorax are bronzy-green, instead of brassy-green, as described and figured by him. The thorax is longer and much

narrower, the elytra more parallel as to their sides; the punctuation of the thorax is larger and deeper. Beneath, less hairy, the hairs shorter. The two apical segments spotted with red on the sides.

Length 12-14 lines, breadth $4\frac{1}{2}$ - $5\frac{1}{2}$.

Hab. New S. Wales.

STIGMODERA LOBICOLLIS. (Plate IX. fig. 5.)

Capite et thorace viridibus, hujus lateribus croceis; elytris ochraceis, striatis, apice utrinque fortiter bispinoso.

Head and thorax green, the latter with its lateral margins ochreous red.

Elytra ochreous red. Beneath, legs, and antennæ green.

Head punctured, covered with short hairs, shallowly furrowed between the eyes. Thorax once and one-third as broad as long at the base; anterior margin slightly elevated, produced at the angles and in the middle; half as long as the base; sides diverging rapidly till about their middle, then subparallel to the base, which is very largely and deeply lobed; surface deeply punctured. Elytra nearly twice as long as wide, simply striate, finely punctured, interval between the sixth and seventh striæ somewhat rugose, striæ between this and the margin punctate; sides swelling out behind the middle; apex of each bispinose. Beneath and legs deeply and closely punctured, covered with short white hairs; two apical segments each with an ochreous spot on each margin.

Length 14 lines, breadth 5.

Hab. Australia.

STIGMODERA JANSONII. (Plate IX. fig. 6.)

Capite et thorace aureo-viridibus, hujus lateribus flavis; elytris punctato-striatis, flavis, sutura prope apicem viridi, apice utrinque bispinoso.

Head and thorax brassy-green; lateral margins of latter testaceous, scutellum green. Elytra testaceous, with their base itself, apex, and the suture for about half their entire length, green. Beneath, legs, and antennæ brassy-green.

Head deeply punctured, covered with short hairs, depressed between the eyes, with a slightly impressed dorsal line. Thorax once and three-quarters as broad as long; anterior margin slightly produced, half as long as the base; sides diverging rapidly till about the middle, then subparallel to the base, giving them a somewhat angulose appearance; base with a wide median lobe; surface deeply punctured, with a slightly impressed dorsal line, whose region is also depressed as it approaches the base. Elytra regularly punctate-striate, twice as long as wide; sides slightly sinuate above the middle; apex of each bispinose. Beneath and legs deeply punctured, hairy.

Length 16 lines, breadth 5.

Hab. Australia.

STIGMODERA SIMILIS. (Plate IX. fig. 7.)

Capite et thorace viridibus, punctatis; elytris testaceis, apice et sutura viridibus; subtus viridis.

Head and thorax greenish blue. Elytra testaceous, with the apex of the same colour as the thorax, which colour extends along the suture for three-quarters of its length, and along the sides for about the same distance. Beneath and antennæ green; sides of abdomen flavous.

Head punctured, covered with white hairs, with a deeply cut dorsal line, Thorax once and two-thirds as broad as long; anterior margin slightly elevated, produced, half as long as base; sides rounded, the widest part of thorax being behind the middle; posterior angles produced and acute; base nearly straight; disk very finely punctured, with an impressed dorsal line, the punctures on the sides much larger and deeper. Elytra once and three-quarters as long as wide; sides slightly sinuate above the middle; apex rounded; disk very shallowly striate, the sides more deeply with the striæ punctate. Beneath and legs finely punctured, covered with scattered white hairs.

Length 16 lines, breadth $6\frac{1}{2}$.

Hab. Queensland.

STIGMODERA BIFASCIATA. (Plate IX. fig. 8.)

Capite thoraceque cupreis, hujus lateribus flavis, præsertim prope angulos posteriores; elytris flavis, duabus fasciis cyaneis ornatis; subtus flava, pedibus viridibus.

Head and thorax coppery, the latter with its lateral margins yellow, which colour spreads on the disk as they approach the base, leaving a small coppery spot just within its limits. Elytra flavous, with two narrow cyaneous bands placed rather close together, one just above the other below the middle, neither of them attaining the lateral margin. Beneath flavous; legs and antennæ green.

Head deeply punctured, with an impressed line between the eyes. Thorax once and three-quarters as long as broad; anterior margin slightly elevated and emarginate, half as long as the base; sides diverging in slightly curved lines till just behind the middle, then somewhat rapidly converging to the posterior angles, which are acute; base nearly straight; surface closely and deeply punctured, with an appearance of a faintly raised dorsal line. Elytra once and two-thirds as long as wide, punctate-striate; sides slightly sinuate above the middle; apex largely rounded. Beneath and legs finely punctured.

Length $8\frac{1}{2}$ lines, breadth 4.

Hab. Swan River.

STIGMODERA PASCOEI. (Plate IX. fig. 9.)

Capite thoraceque igneo-cupreis, punctatis, hujus lateribus prope angulos posteriores flavis; elytris flavis, postice cupreis; subtus flava, cupreo ornata.

Head and thorax coppery red, the latter with its lateral margins testaceous. Elytra testaceous, with just the base and the apex for not quite half their entire length of the same colour as the head and thorax. Beneath testaceous, with the centre of the thorax, breast, and the posterior margin of each abdominal segment, antennæ, and femora coppery-red. Tibiæ and tarsi green.

Head punctured with an impressed dorsal line. Thorax once and four-fifths as broad as long; anterior margin produced, a little more than half as long as the base; sides rounded; posterior angles produced and acute; base bisinuate; surface largely but shallowly punctured, with a smooth dorsal line. Elytra nearly twice as long as wide, striate, the interstices shallowly punctured; sides sinuate above the middle; apex of each somewhat obliquely truncate. Beneath and legs punctured, with a few scattered hairs.

Length 15 lines, breadth $6\frac{1}{2}$.

Hab. Australia.

STIGMODERA WESTWOODII. (Plate IX. fig. 10.)

Capite viridi, duabus maculis testaceis notato; thorace cyaneo, punctato, lateribus late rubris; elytris rubris, fascia lata post medium apiceque cyaneis; subtus ferruginea.

Head bluish-green, with two small red spots between the eyes. Thorax cyaneous, with the margins widely sanguineous. Elytra dark reddish-yellow, with a wide transverse cyaneous band behind the middle; the apex is also of the same colour. Beneath and legs fulvous, with the posterior margin of each abdominal segment, antennæ, and knees cyaneous; exterior face of tibiæ green.

Head deeply punctured, slightly hairy in front, with a faint dorsal line. Thorax once and three-quarters as broad as long; anterior margin slightly produced in the centre and at the angles; sides much rounded, base nearly straight; disk deeply punctured, with a slight smooth dorsal line; anterior margin with an impressed line running parallel to it. Elytra nearly twice as long as wide, punctate-striate, sides nearly straight, apex largely rounded. Beneath and legs punctured, with a few scattered hairs.

Length 17 lines, breadth 7.

Hab. N. Australia.

STIGMODERA THORACICA. (Plate IX. fig. 11.)

Rubra, capite, thoracis disco maculaque ad elytrorum apicem nigris; subtus cyanea, lateribus abdominis rubris.

Head black. Thorax and elytra sanguineous; the former with its centre, and the latter with a large square sutural spot at the apex, cyaneous black. Beneath, legs, and antennæ cyaneous; margins and apex of abdomen sanguineous.

Head punctured, hairy, with a longitudinal impression in front, which widens as it approaches the mouth. Thorax once and four-fifths as

broad as long; anterior margin very slightly produced, not quite half as long as the base; sides diverging rapidly to about the middle, then a little rounded and subparallel to the base, which is bisinuate; surface punctured, especially on the sides; dorsal line slightly impressed; lateral margins elevated and somewhat reflexed. Elytra twice as long as wide, punctate-striate, sides subparallel to about the middle; apex of each with a short sutural spine. Beneath and legs punctured, covered with rather long grey pubescence.

Length 16 lines, breadth $6\frac{1}{2}$.

Closely allied to *S. laticollis*, Thoms., from which it differs in the shape of the thorax, which is less convex, wider in front, the margins reflexed. Elytra more deeply striate, abdomen margined with red.

Hab. Australia.

STIGMODERA SANGUINIVENTRIS. (Plate IX. fig. 12.)

Capite et thorace æneis, punctatis, hujus lateribus rubris; elytris striatis, rubris, apicibus nigris; subtus pectore æneo, abdomine rubro.

Head and thorax bronzy, the latter with its lateral margins red. Elytra red, with just their base and apex bronzy. Beneath, sides of thorax, and the abdomen red; legs and breast and antennæ bronzy.

Head punctured, covered with very short hairs, with a slightly impressed dorsal line. Thorax twice as broad as long; anterior margin nearly straight, half as long as the base; sides diverging in straight lines till behind the middle, then slightly rounded and converging to the base, which is almost straight; surface deeply punctured, especially at the sides; disk with a smooth dorsal line. Elytra once and two-thirds as long as wide; sides sinuate just above the middle; apex truncate; disk finely punctured, striate, the striæ punctured on the sides.

Beneath and legs punctured, hairy.

Length 12 lines, breadth $5\frac{1}{2}$.

Hab. Australia.

STIGMODERA SEXMACULATA. (Plate IX. fig. 13.)

Nigra; thorace macula utrinque elytrisque maculis quatuor rubris; subtus cyanea, lateribus abdominis rubro maculatis.

Black; thorax with a red spot on each margin, commencing at the anterior angle, but not quite touching the base, extending for about a quarter of the entire width of the thorax towards the disk. Elytra each with a large red spot above the middle, which is deeply sinuate on its upper margin and rounded on its inferior, and a smaller one of the same colour midway between the centre of the elytra and the apex; both of these touch the lateral margins, but not quite the suture. Beneath and antennæ cyaneous blue; sides of thorax and abdomen spotted with red.

Head punctured, covered with short hairs. Thorax twice as broad as long; anterior margin slightly produced, ciliate, not quite half as long

as the base; sides rounded; base bisinuate. Elytra twice and one-half as long as wide, punctured, striate; apex of each obtusely bidentate. Beneath and legs punctured, with a few scattered hairs.

Length 17 lines, breadth 7.

Hab. Australia.

STIGMODERA LÆVICOLLIS. (Plate IX. fig 14.)

Capite et thorace viridibus, hujus lateribus flavis; elytris flavis, striatis, fasciis tribus apiceque nigris; abdomine flavo, viridi cingulato.

Head and thorax green, the latter with its lateral margins testaceous.

Elytra yellow, with three transverse bands and the apex black, the first very wide and situated just below the base; all the bands are united on the sides, but not on the suture. Beneath flavous; legs, a triangular spot on the breast, and the posterior margin of each abdominal segment and antennæ green.

Head punctured, with a slight dorsal line, raised on the vertex, and a faintly impressed round fovea between the eyes. Thorax once and two-thirds as broad as long; anterior margin produced, half as wide as the base; sides rounded; base slightly lobed; surface smooth, punctured on the sides. Elytra once and three-fourths as long as wide, punctate-striate, the interstices also punctured; sides sinuate above the middle; apex rounded. Beneath and legs very finely punctured.

Length $15\frac{1}{2}$ lines, breadth 6.

Hab. Australia.

STIGMODERA PUNCTATO-STRIATA. (Plate IX. fig. 15.)

Capite et thorace viridibus; elytris fortiter punctato-striatis, latericeis, maculis tribus utrinque nigris; subtus pedesque virides.

Head and thorax green. Elytra croceous, each with three black spots, one small one, on the shoulders, a larger irregularly shaped one about the middle, and a transverse oval one between it and the apex, which is also margined with the same colour. Beneath, legs, and antennæ green; sides of abdomen spotted with yellow.

Head punctured, depressed between the eyes, and furrowed on the vertex.

Thorax once and three-quarters as wide as long; anterior margin nearly straight, a little more than half as long as the base; sides slightly rounded; posterior angles acute; base with a shallow lobe; disk slightly punctured, with a faint dorsal line, met at the base by a few punctures; punctures on the sides much deeper, especially near the posterior angles, which are slightly depressed; a deeply impressed line runs parallel to the anterior margin, so as to give it a raised appearance. Elytra twice as long as wide, very deeply and largely punctate-striate; sides sinuate above the middle; apex rounded. Beneath and legs deeply punctured, punctuation of the centre of abdomen much finer.

Length $10\frac{1}{2}$ lines, breadth 4.

Hab. Swan River.

STIGMODERA CURTA. (Plate IX. fig. 16.)

Capite et thorace æneis, hujus lateribus flavis; elytris punctato-striatis, flavis, sutura, fasciis duabus post medium et duabus vittis humeralibus cyaneis; subtus aureoviridis.

Head and thorax dull bronzy; sides of the latter narrowly bordered with yellow. Elytra yellow, with the suture, a band below the middle, which reaches the sides, and a short curved band midway between it and the apex cyaneous; from each shoulder is a vitta of the same colour extending for about a third of the entire length of the elytra. Beneath and antennæ green.

Head largely and deeply punctured, channelled between the eyes. Thorax once and three-quarters as wide as long; anterior margin nearly straight, half as long as the base; sides rounded; base slightly sinuate. Elytra once and two-thirds as long as wide, rather wider than the thorax at their shoulders, widest behind the middle, punctate-striate; sides sinuate below the shoulders; apex truncate, with an external tooth on each elytron. Beneath punctured, covered with short grey hairs.

Length 5 lines, breadth 2.

Hab. Australia.

STIGMODERA ABDOMINALIS. (Plate IX. fig. 17.)

Capite et thorace viridibus; elytris sutura, fascia infra medium maculaque prope apicem viridibus, inter basin fasciamque mediam macula oblonga ejusdem coloris; subtus viridis, abdomine testaceo.

Head and thorax bronzy-green. Elytra croceous yellow, with the suture, an angulated band below the middle, and a spot between it and the apex green; the colour of the suture widens out at the base so as to extend about two-thirds across each elytron; there is a vitta of the same colour above the median band between the suture and side, leaving an equal margin of the ground-colour all round it. Beneath, legs, and antennæ bronzy. Abdomen rufous.

Head punctured, deeply excavated between the eyes. Thorax widest just behind the middle, once and three-quarters as broad as long; anterior margin elevated, half as long as the base; sides diverging in almost straight lines till just past the middle, then slightly rounded to posterior angles; base faintly lobed; surface punctured, especially at the sides; dorsal line indicated by a small longitudinal slit at the base. Elytra not quite twice as long as wide, punctate-striate, the interstices also punctured; sides slightly sinuate above the middle; apex simply pointed. Beneath and legs punctured, covered with short fine decumbent white hairs.

Length 6 lines, breadth $2\frac{1}{2}$.

Hab. Australia.

STIGMODERA JEKELLII. (Plate IX. fig. 18.)

Capite et thorace æneis; elytris rubris, sutura, fascia post medium

maculaque inter illam apicemque cyaneis, macula humerali oblonga utrinque ejusdem coloris.

Head and thorax bronzy. Elytra dull red, with the suture, a narrow band below the middle touching the lateral margins, a short one between it and the apex, curved in the arc of a circle, and the apex itself green; there are also two short vittæ extending from the shoulders for about two-fifths of the entire length of the elytra, of the same colour. Beneath, legs and antennæ green; body rufous.

Head punctured, widely channelled between the eyes. Thorax widest about one-third of its length from the base; once and two-thirds as broad as long at the base; anterior margin nearly straight, half as long as the base; sides diverging in nearly straight lines for two-thirds of their length, then suddenly converging to the base, which has a very shallow lobe; surface punctured; punctures very deep on the sides; dorsal line fine and raised. Elytra punctate-striate, almost twice as long as broad, wider than the thorax at the base, the exterior angles of which are very prominent; sides sinuate above the middle; apex of each finely emarginate. Beneath and legs punctured, covered with short white hairs.

Length 9 lines, breadth 4.

Hab. Adelaide.

STIGMODERA SEMISUTURALIS. (Plate IX. fig. 19.)

Capite et thorace punctatis, æneis; elytris sanguineis, sutura ad basin viridi; subtus ænea, corpore rubro.

Head and thorax bronzy. Elytra sanguineous, with the suture for about half its length bronzy. Beneath, legs, and antennæ bronzy; abdomen rufous.

Head punctured, deeply channelled between the eyes. Thorax once and two-thirds as broad as long; anterior margin elevated and produced, half as long as the base; sides diverging in very slightly curved lines for three-quarters of their length, then converging to the posterior angles; base shallowly lobed; surface deeply punctured; disk with a fine smooth dorsal line: near the posterior angle on each side is a slightly impressed round fovea; this character, however, is so faint that it may not be worth much. Elytra twice as long as wide; punctate-striate; sides sinuate above the middle; apex of each finely emarginate. Beneath and legs punctured, covered with short white hairs.

Length 10 lines, breadth 4.

Hab. Australia.

STIGMODERA CYANIPES. (Plate IX. fig. 20.)

Capite et thorace nigris, hujus lateribus late ferrugineis; elytris nigris, fasciis duabus utrinque ferrugineis; subtus nigra, lateribus abdominis rubris, pedibus cyaneis.

Head and thorax bronzy black, the margins of the latter ferruginous,

the colour widening as it approaches the base; elytra black, with a cyaneous tinge, with a wide transverse band on each, starting from just behind the shoulder, but not reaching the suture, its lower margin being about two-thirds of the entire length of the elytra from the base; in the specimen before me the yellow runs up in front of the shoulder and nearly touches the base; but this character is liable to great variation; there is also an oval transverse spot of the same colour midway between it and the apex. Beneath black; sides of the first three abdominal segments, and the whole of the last two, testaceous; legs and antennæ cyaneous.

Head deeply punctured, furrowed between the eyes. Thorax once and two-thirds as long as the base; anterior margin nearly straight, half as long as the base; sides diverging rapidly for two-thirds of their length, then converging to the base, thus forming a strongly marked angle on each; base straight; surface punctured with a very faint smooth dorsal line. Elytra punctate-striate, once and two-thirds as long as wide; sides slightly sinuate above the middle; apex of each obliquely truncate. Beneath and legs punctured, with a few scattered hairs.

Length 8-9 lines, breadth $3-3\frac{1}{2}$.

Hab. Adelaide.

STIGMODERA MARGINICOLLIS. (Plate X. fig. 21.)

Capite et thorace cyaneo-nigris, hujus lateribus flavis; elytris nigris, duabus fasciis angustis utrinque flavis; subtus sanguinea, femoribus cyaneis.

Head brassy-green. Thorax and elytra cyaneous black, the former with its lateral margins, the latter with two bands on each, not reaching the suture, ochraceous, one of these being placed just above the middle, the other nearly midway between it and the apex. Beneath and femora fulvous; the tips of latter, the tibiæ, tarsi, and antennæ cyaneous green.

Head largely and deeply punctured, excavated between the eyes. Thorax not quite twice as broad as long at the base; anterior margin slightly emarginate, half as long as the base; sides diverging rapidly for two-thirds of their length, thence converging to posterior angles; base slightly sinuate; disk convex, punctured with a faint dorsal line, the punctuation of the sides rather deeper, which each bear a slight elongate fovea which runs parallel to the lateral margin just above the posterior angle. Elytra punctate-striate, a little more than once and a half as long as wide, base slightly narrower than the thorax, widening considerably at the shoulders, sinuate below them, and swelling out again behind the middle; apex of each bidentate. Beneath and legs punctured, covered with short white hairs.

Length 10 lines, breadth 4.

Hab. New S. Wales.

STIGMODERA GIBBICOLLIS. (Plate X. fig. 22.)

Capite thoraceque punctatis, nigris, hujus lateribus late ferrugineis; elytris cyaneis, fasciis duabus latis utrinque testaceis; subtus punctata, cyanea, pubescens.

Head and thorax black, the former with the mouth cyaneous, the latter with its lateral margins rufous. Elytra cyaneous, with a wide triangular ferruginous spot on each, just above the middle, touching the lateral margin, the apices of the triangles almost meeting on the suture; between this and the apex is a slightly curved band on each, not quite touching the suture. Beneath, legs, and antennæ cyaneous.

Head punctured, with a deep channel between the eyes. Thorax at the base once and two-thirds as broad as long; anterior margin slightly elevated and emarginate, half as long as the base; sides diverging in rather curved lines till within about a third of their length from the base, then rounded and converging to the posterior angles; base slightly sinuate; disk convex, punctured, with a smooth dorsal line. Elytra punctate-striate, twice as long as wide; sides sinuate below the shoulders; apex of each terminating in a sharp point. Beneath and legs punctured, covered with white hairs.

Length 5 lines, breadth 2.

Hab. Adelaide.

STIGMODERA CUPRICOLLIS. (Plate X. fig. 23.)

Capite et thorace cupreis, punctatis; elytris striatis, nigris, tribus fasciis utrinque flavis; subtus cuprea, punctata.

Head and thorax cupreous, disk of latter purplish. Elytra black, each with a short flavous band extending from the shoulder to about a quarter of the entire breadth of the elytron from the suture, and two others of the same colour, one placed just above the middle, the other, which is rather wider, between it and the apex; neither of these quite touch the suture. Beneath, legs, and antennæ coppery; tarsi aureous.

Head deeply punctured, channelled between the eyes. Thorax at the base once and three-quarters as wide as long; anterior margin elevated, nearly straight, half as long as the base; sides diverging in straight lines for two thirds of their length, then subparallel to the base, which is almost straight; surface punctured, the punctures on the sides, especially near the posterior angles, larger and deeper; disk with a faint smooth dorsal line terminating at its base in a deep puncture. Elytra punctate-striate, once and two-thirds as long as wide; sides swelling out slightly behind the middle, apex of each minutely bidentate. Beneath and legs punctured, covered with a short silky white pubescence.

Length 9 lines, breadth $3\frac{1}{2}$.

Hab. Australia.

STIGMODERA COSTATA. (Plate X. fig. 24.)

Capite et thorace æneis, punctatis; elytris striatis, flavis, interstitiis

elevatis, sutura fasciisque duabus post medium cyaneis, maculaque utrinque humerali oblonga ejusdem coloris.

Head and thorax bronzy. Elytra testaceous, with the suture, a band crossing it just below the middle, nearly touching the lateral margins, a short semilunar spot between it and the apex, and the apex itself cyaneous; above the band, between the suture and the lateral margin, on each, is an oblong spot of the same colour. Beneath and legs and antennæ bronzy.

Head punctured, channelled between the eyes. Thorax once and two-thirds as wide as long; anterior margin slightly elevated and rounded, a little more than half as long as the base; sides gradually rounded: base with a shallow triangular lobe; surface punctured, punctuation of the sides denser; disk with a slightly impressed dorsal line; near each posterior angle is a small round depression. Elytra punctate-striate, the third, fifth, and ninth interstices much raised and rounded; sides sinuate above the middle, apex of each bidentate, the outer tooth being produced almost into a short spine. Beneath and legs punctured, covered with a cinereous pubescence.

Length $6\frac{1}{2}$ lines, breadth $2\frac{1}{2}$.

Hab. New S. Wales.

STIGMODERA PICTIPENNIS. (Plate X. fig. 25.)

Capite thoraceque viridibus; elytris flavis, sutura, marginibus lateralibus fasciisque duabus cyaneis, maculaque humerali ejusdem coloris; subtus flavâ, viridi ornata.

Head and thorax green. Elytra testaceous, with the base, suture, and lateral margin from a third of its entire length from the base cæruleous; a vita of the same colour originates at the base, and joins the lateral margin where the latter becomes cæruleous, so as to leave the margin between the point of juncture and the base testaceous; there is a band of the same colour behind the middle, slightly bent downwards from the suture to the lateral margin, and a similar shorter one between it and the apex. Beneath testaceous; sides of breast, a triangular spot on the same, a semilunar one on the first abdominal segment, and the posterior margins of the rest green; there is also a small green spot on the first three, near the lateral margin; legs and antennæ green.

Head deeply punctured, furrowed between the eyes. Thorax once and two-thirds as wide as long; anterior margin produced in the centre, two-thirds as long as the base; sides much rounded just behind the anterior angles, then subparallel to the base, which is nearly straight; surface very closely punctured, with an irregular smooth dorsal line. Elytra twice as long as wide, deeply and rugosely punctate-striate; sides subparallel for two-thirds of their length, slightly reflexed; apex of each terminating in a sharp exterior tooth. Beneath and legs punctured, covered with scattered white hairs.

Length 6 lines, breadth $2\frac{1}{2}$.

Hab. Swan River.

STIGMODERA RECTIFASCIATA. (Plate X. fig. 26.)

Capite et thorace æneobrunneis, nitentibus; elytris flavis, punctato-striatis, tribus fasciis nigris; subtus ænea, albo pubescens.

Head and thorax bronzy-brown. Elytra flavous, with a narrow straight band below the base, a wider one behind the middle, and the apex for two-fifths of their entire length black; the colour of the postmedian band unites with that of the apex on the suture.

Beneath bronzy, with purple reflections; legs and antennæ cyaneous.

Head punctured, channelled between the eyes. Thorax at the base once and a half as broad as long; anterior margin produced in the centre, half as long as base; sides rounded, base with a very shallow lobe; surface very shining, remotely punctured; dorsal line indicated by a deep puncture at the base and a longitudinal impression near the anterior margin; close to each posterior angle is a small transverse fovea. Elytra once and three-quarters as long as wide, punctate-striate, the third, fifth, seventh, and ninth interstices raised and rounded. Sides sinuate above the middle; apex of each with a sharp external spine.

Beneath and legs punctured, covered with an adpressed grey pubescence.

Length $6\frac{1}{2}$ lines, breadth $2\frac{1}{2}$.

Hab. Australia.

STIGMODERA OCTOMACULATA, Reiche (MS.). (Plate X. fig. 27.)

Capite et thorace æneis; elytris ferrugineis, octo maculis rotundis æneis ornatis; subtus ænea, punctata.

Head and thorax bronzy. Elytra ferruginous, with eight subrotund bronzy spots, two of which are on the suture, the other six are arranged three on each lateral margin, one being on the shoulder, the second placed rather diagonally about the middle, and the third midway between it and the apex. Beneath, legs, and antennæ bronzy.

Head punctured, widely channelled between the eyes. Thorax once and a half as broad as long at the base; anterior margin slightly elevated, nearly straight, a little more than half as long as the base; sides rounded above the middle, then nearly straight to the posterior angles, which are almost right angles; base straight; surface punctured, especially on the sides; disk with an impressed dorsal line. Elytra once and three-quarters as long as wide, punctate-striate; sides subparallel above the middle; apex of each with a small obsolete tooth. Beneath and legs punctured, covered with a short grey pubescence.

Length $5\frac{1}{2}$ lines, breadth 2.

Hab. Adelaide.

STIGMODERA ÆNEICORNIS. (Plate X. fig. 28.)

Capite thoraceque cyaneis; elytris punctato-striatis, ferrugineis, sutura

fasciaque brevi post medium maculaque apicali ejusdem coloris; subtus cyanea, antennis æneis.

Head and thorax cæruleous, the latter with the disk obscure. Elytra croceous, suture cyaneous, spreading into a small diamond-shaped spot just below the base, a much wider lunulate one below the middle, and a triangular one just above the apex. Beneath and legs cyaneous; antennæ brassy-green.

Head deeply punctured, furrowed between the eyes. Thorax once and a half as wide as long, anterior margin nearly straight and slightly elevated, sides rounded, base straight; surface punctured, especially on the sides. Elytra at the shoulders much wider than the thorax, largely punctate-striate; sides sinuate below the shoulders; apex of each with a small external tooth; beneath and legs punctured, with a few scattered white hairs.

Length 5 lines, breadth 2.

Hab. New S. Wales.

STIGMODERA CRUX. (Plate X. fig. 29.)

Capite thoraceque punctatis, æneis; elytris flavis, sutura fasciaque post medium cyaneis, maculaque humerali ejusdem coloris; subtus ænea.

Head and thorax bronzy. Elytra flavous, with the suture and a band crossing it behind the middle cæruleous, thus forming an inverted cross; the colour of the suture widens slightly below the base, and considerably (so as to form a small triangle) near the apex; between the suture and lateral margin, just below the shoulder, is an oval spot of the same colour. Beneath bronzy; legs and antennæ cyaneous.

Head punctured, deeply furrowed between the eyes. Thorax at its base once and two-thirds as broad as long; anterior margin slightly emarginate and raised, half as long as the base; sides rounded behind the middle; base bisinuate; surface punctured; disk convex, with a slightly impressed dorsal line. Elytra finely punctate-striate, nearly twice as long as wide; shoulders rather prominent; sides sinuate above the middle; apex of each subdentate. Beneath and legs punctured, covered with a rather long grey pubescence.

Length 5 lines, breadth 2.

Hab. Australia.

STIGMODERA DISTINGTA. (Plate X. fig. 30.)

Capite et thorace æneis; elytris flavis, punctato-striatis, fascia post medium apicibusque nigris; subtus ænea, pubescens.

Head and thorax bronzy. Elytra testaceous, with a narrow nearly straight band behind the middle, and their apex black. Beneath, legs, and antennæ cyaneous.

Head deeply punctured, impressed between the eyes. Thorax at its base twice as wide as long; anterior margin elevated and emarginate, half as long as the base; sides slightly rounded; base bisinuate

surface largely and somewhat remotely punctured; just above the scutellum is a larger round puncture. Scutellum large, cordiform. Elytra punctate-striate, once and two-thirds as long as wide; shoulders rather prominent; sides sinuate above the middle; apex of each widely truncate, with a short external spine. Beneath and legs punctured, covered with short white hairs.

Length 5 lines, breadth 2.

Hab. Australia.

STIGMODERA PILIVENTRIS. (Plate X. fig. 31.)

Capite thoraceque fortiter punctatis, æneis; elytris rubris, macula suturali post basin, fascia media maculaque apicali cyaneis; subtus cyanea, dense albo pubescens.

Head and thorax bronzy. Elytra red, with a triangular spot on the suture below the scutellum; a transverse post-median band, which is widest on the suture, and gradually narrowing to the lateral margins, and a somewhat square sutural spot reaching the apex, cyaneous. Beneath cyaneous, covered very densely with rather long white hairs; legs and antennæ cyaneous.

Head deeply punctured, channelled between the eyes. Thorax at its base once and three-quarters as wide as long; anterior margin slightly raised and emarginate; sides rounded; base bisinuate; surface deeply punctured, especially on the sides; disk very convex, with a slightly impressed dorsal line met at the base by a large puncture. Elytra once and two-thirds as long as wide, punctate-striate, the interstices slightly raised, and deeply punctured, especially on the sides; sides sinuate below the shoulders; apex of each finely emarginate, with a sharp external tooth. Beneath and legs punctured, densely pubescent.

Length $5\frac{1}{2}$ lines, breadth 2.

Hab. Queensland.

STIGMODERA CARMINEA, H. Deyr. (MS.). (Plate X. fig. 32.)

Capite thoraceque æneis; elytris sanguineis, tribus fasciis cyaneis; subtus cyanea, albo pubescens.

Head and thorax bronzy. Elytra deep red, with two wide transverse bands, one close to the base touching it at the scutellum, and the second near the middle, cyaneous; between this and the apex is a triangular sutural spot of the same colour. Beneath and legs and antennæ cyaneous.

Head punctured, deeply impressed between the eyes. Thorax once and three-quarters as broad as long; anterior margin emarginate, raised, half as long as the base; sides gradually rounded; base with a very shallow median lobe; surface deeply punctured, with a slightly raised dorsal line, met at the base by a large puncture. Elytra much wider than the thorax at the shoulders, once and three-quarters as long as wide, punctate-striate, the interstices also punctured; sides

sinuate below the shoulders; apex of each finely emarginate. Beneath punctured, covered with short white hairs.

Length 6 lines, breadth 3.

Hab. New S. Wales.

STIGMODERA OBSCURIPENNIS. (Plate X. fig. 33.)

Capite thoraceque viridibus, punctatis; elytris sordide rubris, tribus fasciis viridibus; subtus aureo-viridis.

Head and thorax green. Elytra brownish red, with three green transverse bands, one below the base produced on the suture, so as to touch the scutellum, the second behind the middle, the third between it and the apex, these latter two are united on the suture; the apical one does not reach the lateral margins, and is rounded on its lower side. Beneath and legs and antennæ golden green.

Head punctured, depressed between the eyes. Thorax once and three-quarters as wide as long; anterior margin slightly elevated, and produced in its centre, half as long as the base; sides rounded; posterior angles acute; base with a shallow median lobe; surface deeply and largely punctured; disk with a smooth slightly raised dorsal line. Elytra rugosely punctate-striate, twice as long as wide; sides sinuate below the shoulders; apex of each with a blunt tooth. Beneath and legs punctured, sparsely covered with long white hairs.

Length $6\frac{1}{2}$ lines, breadth $2\frac{1}{2}$.

Hab. Swan River.

STIGMODERA CUPRICAUDA. (Plate X. fig. 34.)

Capite thoraceque æneis; elytris flavis, punctato-striatis, fasciis duabus cupreo-brunneis, apice cupreo; subtus ænea, pubescens.

Head and thorax bronzy, with greenish reflections. Elytra testaceous, with two transverse bands coppery brown, the apex coppery; the upper of these becomes divaricated as it approaches the lateral margin, one branch extending on to the shoulder, the other touching the margin about a third of the length of the elytra from the base; the postmedian band is widest at the suture and slightly produced about the middle of its upper margin. Beneath and legs and antennæ bronzy.

Head deeply and largely punctured, impressed between the eyes. Thorax once and three-quarters as broad as long at the base; anterior margin elevated, nearly straight, not quite two-thirds as long as the base; sides rounded, posterior angles acute; base almost straight. Surface largely punctured, with a slightly impressed dorsal line. Elytra twice as long as wide, punctate-striate; sides sinuate below the shoulders; apex of each finely bidentate, external tooth longest. Beneath and legs punctured, densely covered with a long sericeous grey pubescence.

Length 6 lines, breadth 2.

Hab. New S. Wales.

STIGMODERA CYLINDRACEA. (Plate X. fig. 35.)

Capite thoraceque æneis, punctatis; elytris flavis, marginibus sanguineis, tribus fasciis nigris ornatis; subtus ænea.

Head and thorax coppery green, the latter rather darker on the disk.

Elytra testaceous, with its lateral margins sanguineous, traversed by three black bands, the two upper ones narrow, the apical one being of a triangular form; of these the postmedian one alone reaches the lateral margins. Beneath and legs and antennæ golden green.

Head punctured, channelled between the eyes. Thorax subglobose, once and two-thirds as broad as long; anterior margin nearly straight and elevated, half as long as the base; sides much rounded; base with a very shallow lobe; disk very convex, punctured, with a slightly impressed dorsal line, punctation of the sides deeper. Elytra twice as long as wide, punctate-striate; sides subparallel for two-thirds of their length; apex of each with a slight point. Beneath and legs punctured, with a few scattered white hairs.

Length $6\frac{1}{2}$ lines, breadth 2.

Hab. New S. Wales.

STIGMODERA WILSONI, *H. Deyr.* (MS.). (Plate X. fig. 36.)

Capite et thorace æneis, punctatis; elytris cupreo-brunneis, vitta longitudinali prope basin maculaque transversa ad apicem flavis; subtus ænea.

Head and thorax bronzy green. Elytra purple; each with a testaceous vitta, originating quite close to the base and extending not quite to their middle, it then turns at right angles to itself, touching the lateral margin; below this, midway between it and the apex, is a small crescent-shaped spot. Beneath of thorax and breast and antennæ cyaneous, abdomen olivaceous.

Head deeply punctured, channelled between the eyes. Thorax widest about the middle, at its base once and a half as broad as long; anterior margin elevated, nearly straight, two-thirds as long as the base; sides much rounded; base with a narrow median lobe; surface deeply punctured, disk with a slightly raised dorsal line, met at the base by a small round fovea. Elytra a little more than twice as long as wide, punctate-striate, the interstices slightly raised; sides subparallel for two-thirds of their length; apex of each emarginate and bidentate, the exterior tooth much the stronger. Beneath and legs punctured, covered with very short white hairs.

Length 5 lines, breadth $1\frac{1}{2}$.

Hab. Australia.

STIGMODERA INCONSPICUA. (Plate X. fig. 37.)

Capite thoraceque nigris, punctatis; elytris punctato-striatis, flavis, tribus fasciis nigris ornatis; subtus ænea, dense pubescens.

Head and thorax bronzy black. Elytra testaceous, with the suture, two transverse bands, and the apex black; the band near the base

widens and divides into two as it approaches the lateral margin. Beneath, legs, and antennæ bronzy.

Head closely punctured, shallowly furrowed between the eyes. Thorax once and two-thirds as broad as long at the base; anterior margin slightly emarginate and raised, two-thirds as long as the base; sides much rounded before the middle, then subparallel to the posterior angles; base with a shallow median lobe; surface closely punctured; disk with a faint dorsal line met at the base by a large puncture. Elytra once and three-quarters as long as wide; punctate-striate; sides sinuate above the middle; apex of each very finely emarginate. Beneath and legs punctured, covered with silky white hairs.

Length 6 lines, breadth $2\frac{1}{2}$.

Hab. Australia.

STIGMODERA THOMSONI. (Plate X. fig. 38.)

Capite thoraceque cyaneo-nigris, punctatis; elytris punctato-striatis, sanguineis, tribus fasciis viridibus; subtus viridis.

Head and thorax bronzy black. Elytra sanguineous, with a transverse band below the base, touching the scutellum in its middle, but not reaching the lateral margins, a wide postmedian band and the apex olivaceous green. Beneath, legs, and antennæ green.

Head punctured, with a deep excavation and incision between the eyes. Thorax twice as broad as long at the base; anterior margin nearly straight, and raised, half as long as the base; sides diverging in very slightly emarginate lines for two-thirds of their length, then subparallel to the posterior angles; base with a shallow median lobe; surface largely and deeply punctured, with a very faintly impressed dorsal line apparent chiefly at the base. Elytra twice as long as wide, striated; the interstices finely punctured; sides sinuate below the shoulders; apex of each finely truncate, with a small external tooth. Beneath and legs punctured, covered with long grey hairs.

Length 7 lines, breadth 3.

Hab. Australia.

STIGMODERA 4-FASCIATA. (Plate X. fig. 39.)

Capite thoraceque cupreis, hujus basi macula cyanea ornata; elytris punctato-striatis, flavis, quatuor fasciis transversis cyaneis; subtus cyanea.

Head and thorax cupreous, the former with the mouth cæruleous, the latter with a large cyaneous spot extending from the centre of the base and not quite touching the anterior margin. Elytra testaceous, with three transverse bands, and the apex cyaneous; the basal one contracts on the suture, and does not touch the lateral margin; the median band is wavy and touches it; the third is shorter and nearly straight. Beneath of thorax, breast, and legs and antennæ cyaneous; abdomen olivaceous.

Head punctured, with an impressed longitudinal line between the eyes.

Thorax once and two-thirds as broad as long; anterior margin nearly straight, somewhat elevated, half as long as the base; sides rounded; base almost straight; surface punctured, especially on the sides; disk with a very faint dorsal line, met at the base by a very small round fovea. Elytra twice and a quarter as long as wide, rugosely punctate-striate; the interstices also punctured; sides slightly sinuate above the middle; apex of each somewhat produced and bidentate; the outer tooth much the longer. Beneath and legs punctured; sides of thorax, breast, and abdomen covered with a white sericeous pubescence.

Length $5\frac{1}{2}$ lines, breadth $1\frac{1}{2}$.

Hab. Australia.

STIGMODERA VITTATA, *H. Deyr.* (MS.). (Plate X. fig. 40.)

Capite thoraceque æneo-viridibus; elytris punctato-striatis, nigris, marginibus lateralibus vittaque utrinque flavis; subtus brunnea, pubescens.

Head and thorax bronzy green. Elytra purplish black, with their lateral margins and a wide vitta on each extending almost from the base for five-sixths of the entire length of the elytra, and gradually becoming narrower as it approaches the apex, flavous. Beneath, legs, and antennæ cupreous brown. Head punctured, impressed between the eyes. Thorax at the base once a half as broad as long; anterior margin nearly straight and slightly elevated, two-thirds as long as the base; sides rounded; base straight.

Surface largely and deeply punctured; disk with an impressed dorsal line. Elytra twice and a quarter as long as wide; punctate-striate; sides subparallel for two-thirds of their length; apex of each with an external tooth. Beneath and legs punctured, covered with short white hairs.

Length 6 lines, breadth 2.

Hab. Adelaide.

STIGMODERA LUTEOCINCTA. (Plate X. fig. 41.)

Viridis, punctata; elytris punctatis, striatis, luteo cinctis, præsertim prope apicem; subtus aureo-viridis, abdomine ferrugineo.

Brassy green. Elytra entirely surrounded by a narrow testaceous belt, the colour spreading on the apex and extending across the elytra for about a third of their entire length from the apex; close to the apex is a small crescent-shaped spot of the same colour as the disk of the elytra. Beneath of thorax, breast, legs, and antennæ green; abdomen ferruginous.

Head largely punctured, channelled between the eyes. Thorax once and two-thirds as broad as long; anterior margin slightly produced and elevated, half as long as the base; sides diverging for two-thirds of their length, then slightly emarginate to the posterior angles; base almost straight; surface deeply punctured, with a smooth dorsal

line. Elytra not quite twice as broad as long, punctate-striate, the interstices very finely punctured; sides sinuate above the middle; apex of each very finely emarginate. Beneath and legs punctured, covered with a short sericeous pubescence.

Length 7 lines, breadth $2\frac{1}{2}$.

Hab. Australia.

STIGMODERA MIMUS. (Plate X. fig. 42.)

Capite cyaneo; thorax ferrugineo, macula nigra antice ornato; elytris olivaceis, fascia prope apicem testacea; subtus ferruginea, lateribus nigro maculatis; pedibus cyaneis.

Head greenish black. Thorax sanguineous, with a large black transverse spot extending along the anterior margin, but not quite touching it, and produced on its inferior margin in the centre so as to form a very much flattened T, black. Elytra olivaceous, with a band just above the apex, and the lateral margin from behind the shoulder to about its middle testaceous. Beneath croceous, with an oblong spot on each side of the breast, a crescent-shaped spot in its centre, two small lateral spots on each abdominal segment, and legs and antennæ cyaneous.

Head deeply punctured, longitudinally impressed between the eyes. Thorax once and three-quarters as wide as long; anterior margin slightly emarginate, half as long as the base; sides diverging in nearly straight lines to the middle, then rounded and converging to the posterior angles; base with a shallow median lobe; surface deeply punctured throughout, with a faint smooth dorsal line. Elytra a little more than once and three-quarters as long as wide, very densely punctured, the punctures becoming larger and denser on the sides; sides deeply sinuate above the middle; apices rounded. Beneath and legs punctured, sparsely covered with very short white hairs.

Length 7 lines, breadth 3.

Hab. Queensland.

STIGMODERA SUBBIFASCIATA. (Plate X. fig. 43.)

Purpurea, punctata; elytris punctato-striatis, duabus fasciis flavis utrinque; subtus punctata, purpurea.

Above purple. Elytra with two transverse flavous bands, one situated below the base, the other about a third of the entire length of the elytra from the apex; this latter is interrupted on the suture. Beneath, legs, and antennæ purple. Head punctured with an impressed line between the eyes. Thorax once and a half as broad as long. Anterior margin nearly straight, two-thirds as long as the base; sides rounded; base bisinuate; surface punctured; disk with an impressed dorsal line. Elytra twice as long as wide, punctate-striate, the third, fifth, seventh, and ninth interstices raised; sides slightly sinuate below the shoulders; apex of each very finely emarginate and bidentate.

Beneath and legs punctured, with scattered white hairs.

Length $5\frac{1}{2}$ lines, breadth $1\frac{1}{2}$.

Hab. Australia.

STIGMODERA AMPLIPENNIS. (Plate X. fig. 44.)

Capite thoraceque nigris, punctatis; elytris punctatis, striatis, ferrugineis, apice nigro; subtus cyanea.

Head and thorax black. Elytra croceous, with the suture and apex black.

Beneath, legs, and antennæ cyaneous black.

Head finely punctured, deeply channelled between the eyes. Thorax once and three-quarters as broad as long at the base; anterior margin raised, emarginate, half as long as the base; sides diverging in rather curved lines for about five-sixths of their length, then rounded to the posterior angles; base bisinuate; surface largely but sparsely punctured, with a smooth dorsal line met at the base by a large puncture. Elytra once and two-thirds as long as wide, deeply crenate-striate; the interstices raised, and largely punctured; sides much sinuate below the shoulders, then swelling out and converging to the apex, which is emarginate and somewhat bidentate. Beneath and legs punctured, covered with short grey hairs.

Length 7 lines, breadth 3.

Hab. Australia.

STIGMODERA MACULIPENNIS. (Plate X. fig. 45.)

Capite thoraceque nigris, nitentibus; elytris punctato-striatis, rubris, macula magna in disco posita apiceque nigris; subtus nitida, cyanea et punctata.

Head and thorax black. Elytra miniatous, with a large somewhat triangular black spot on their disk, the sides gradually rounded, and the apex of the same colour; the centre of the discal spot is situated as near as possible in the middle of the elytra. Beneath, legs, and antennæ dark cyaneous blue.

Head finely punctured, deeply channelled between the eyes. Thorax twice as broad as long; anterior margin slightly raised, half as long as the base, with a shallow median lobe; surface shining, finely and regularly punctured, near each posterior angle is a small round punctured fovea. Elytra once and three-quarters as long as wide; punctate-striate, the interstices much raised; sides sinuate below the shoulders, swelling out again behind the middle; apex of each truncate, with a short external tooth. Beneath and legs finely punctured, covered with a very short fine pubescence.

Length 7 lines, breadth $2\frac{1}{2}$.

Hab. New S. Wales.

STIGMODERA ELONGATA. (Plate X. fig. 46.)

Capite et thorace viridi-æneis, punctatis; elytris punctato-striatis, testaceis, sutura late cyanea; subtus cyanea, punctata.

Head cyaneous. Thorax bronzy-green, with cyaneous reflections. Elytra testaceous, with a wide cyaneous stripe down the suture. Beneath, legs, and antennæ cyaneous, with green reflections.

Head punctured, channelled between the eyes. Thorax not quite twice as wide as long at the base; anterior margin nearly straight and raised, half as long as the base; sides regularly rounded; base bisinuate, surface largely punctured, with an impressed dorsal line, and a slight impression on each lateral margin near the posterior angle. Elytra twice as long as wide, punctate-striate; sides subparallel till slightly past the middle, then converging to their apices, each of which is armed with a short, external, somewhat bent-inwards spine. Beneath and legs punctured very sparsely, covered with a few short hairs.

Length 9 lines, breadth 3.

Hab. Swan River.

STIGMODERA JUCUNDA. (Plate X. fig. 47.)

Capite et thorace viridi-aureis, punctatis; elytris flavis, punctato-striatis, apice cyaneo; subtus aureo-viridis.

Head and thorax golden. Elytra flavous, with the apex green. Beneath, legs, and antennæ brassy-green.

Head punctured, channelled between the eyes. Thorax once and three-quarters as wide as long; anterior margin raised and slightly produced, half as long as the base; sides regularly rounded; base with a shallow median lobe; surface deeply and largely punctured, with a smooth dorsal line met at the base by two short very small longitudinal impressions. Elytra not quite twice as long as wide, punctate-striate, sides deeply sinuate above the middle, apices largely rounded. Beneath and legs punctured, with a short white pubescence.

Length 8 lines, breadth 3 lines.

Hab. Australia.

STIGMODERA BIMACULATA. (Plate X. fig. 48.)

Capite thoraceque cupreis, punctatis; elytris testaceis, punctato-striatis, utrinque macula parva post medium posita apiceque nigris; subtus cuprea, abdomine flavo.

Head and thorax cupreous. Elytra testaceous, with a small round spot on each, just behind the middle, and the apex black. Beneath of thorax, breast, and legs and antennæ cupreous. Abdomen flavous.

Head punctured, excavated between the eyes; there is also an impression on each side between the excavation and the eye, joining the former near the top of the forehead. Thorax, at the base, once and a half as broad as long; anterior margin produced in the centre, half as long as the base; sides diverging in nearly straight lines for not quite two-thirds of their length, then converging in rather emarginate

lines to the posterior angles; base with a shallow median lobe; surface shining, deeply punctured, with two smooth irregular transverse spaces near the anterior margin, and two smaller longitudinal ones near the base; dorsal line widely impressed and deeply punctured; near the posterior angles on each side is a slight rugosely punctured fovea. Elytra twice as long as wide, punctate-striate, shoulders rather prominent, sides sinuate above the middle, apex of each with a sharp external spine and a small sutural tooth. Beneath and legs punctured, slightly pubescent.

Length 7 lines, breadth $2\frac{1}{3}$ lines.

Hab. North-west Australia.

STIGMODERA TRIMACULATA. (Plate X. fig. 49.)

Capite nigro; thorace flavo, macula nigra ad basin posita; elytris flavis, punctato-striatis, macula utrinque post medium apiceque nigris; subtus cyanea.

Head black. Thorax and elytra testaceous; the former with an oval black spot in the centre of the base; the latter with a transverse spot on each behind the middle and the apex of the same colour. Beneath and legs and antennæ cyaneous, the sides of the thorax excepted, which are testaceous.

Head deeply punctured, with a deep incision to about its middle between the eyes. Thorax once and two-thirds as broad as long at the base; anterior margin slightly raised, emarginate, scarcely half as long as the base; sides diverging rapidly for two-thirds of their length, then converging to the posterior angles; base with a narrow small median lobe; disk transversely raised; surface finely punctured, dorsal line marked by a deep longitudinal incision near the base. Elytra not quite twice as long as wide, punctured and striated; sides sinuate above the middle; apex of each armed with an external spine. Beneath and legs punctured, covered with very short white hairs.

Length 7 lines, breadth $2\frac{3}{4}$.

Hab. North-west Australia.

STIGMODERA PRODUCTA. (Plate X. fig. 50.)

Capite thoraceque æneo-viridibus, nitentibus, hujus disco linea dorsali fortiter impresso; elytris punctato-striatis, nigris, utrinque tribus maculis testaceis, horum marginibus externis sanguineis; subtus ænea, pedibus læte cyaneis.

Head and thorax bronzy. Elytra black, with greenish reflections, with an irregularly triangular spot above the shoulder, a somewhat oval one not quite touching it, situated about a third of the entire length of the elytra from their base, and a large lateral one produced near its upper extremity, across about three-quarters of the elytron, flavous; the exterior margins of this and the humeral spot are sanguineous. Beneath bronzy green, legs and antennæ ceruleous.

Head finely punctured, channelled between the eyes. Thorax at the

base once and two-thirds as broad as long; anterior margin elevated, nearly straight, half as long as the base; sides much rounded; base with a deep central lobe; surface minutely punctured, disk with a deeply impressed dorsal line, widest and deepest at the base; on each side near the posterior angle is a small elongate impression. Elytra twice as long as wide, punctate-striate, the interstices very closely and finely punctured; the third interstice much raised and rounded; shoulders rather prominent; sides sinuate below them, greatly produced and attenuated to the apex, which terminates in a short external spine. Beneath and legs punctured, with a short golden pubescence.

Length 6 lines, breadth 2.

Hab. West Australia.

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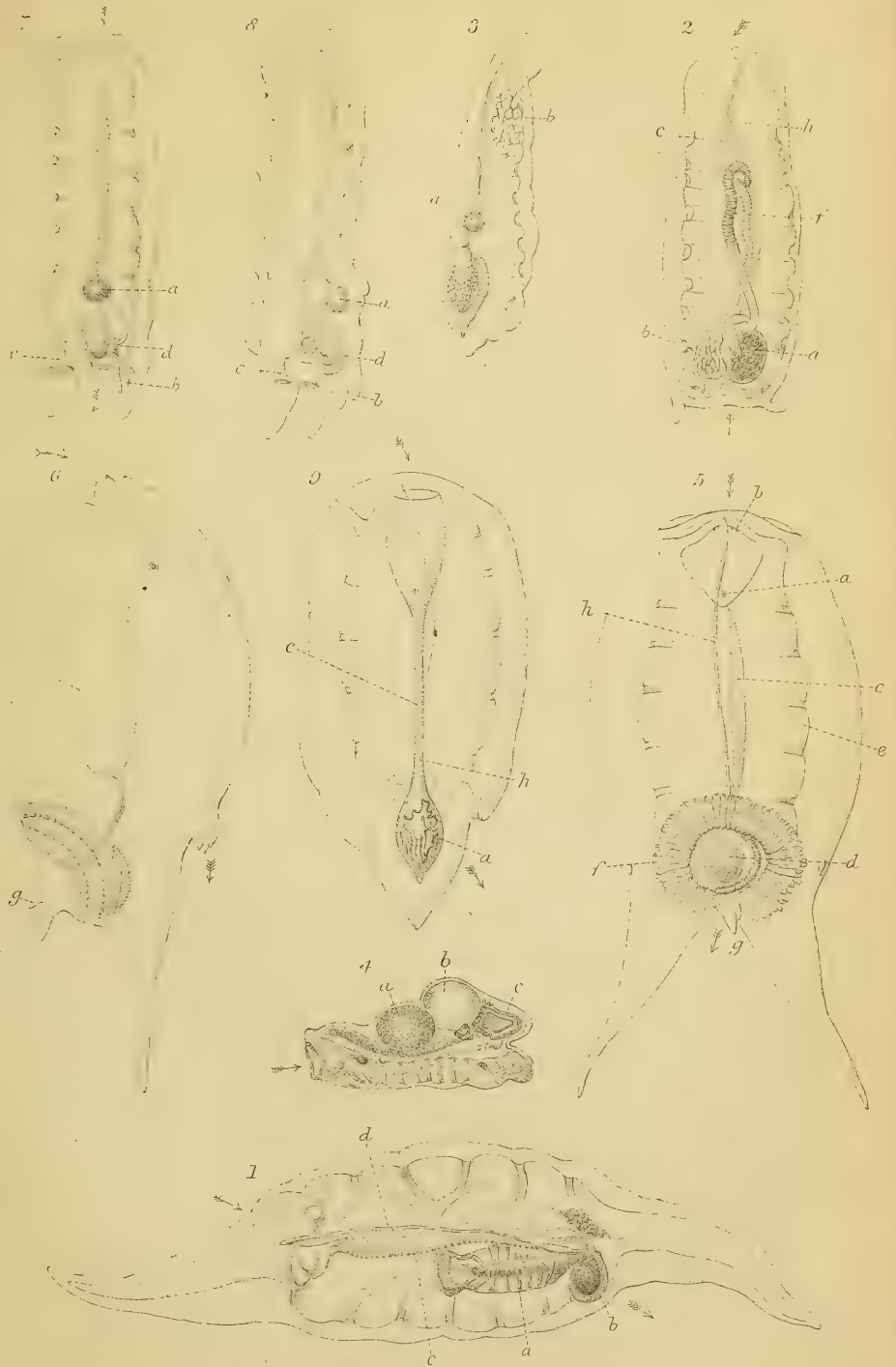
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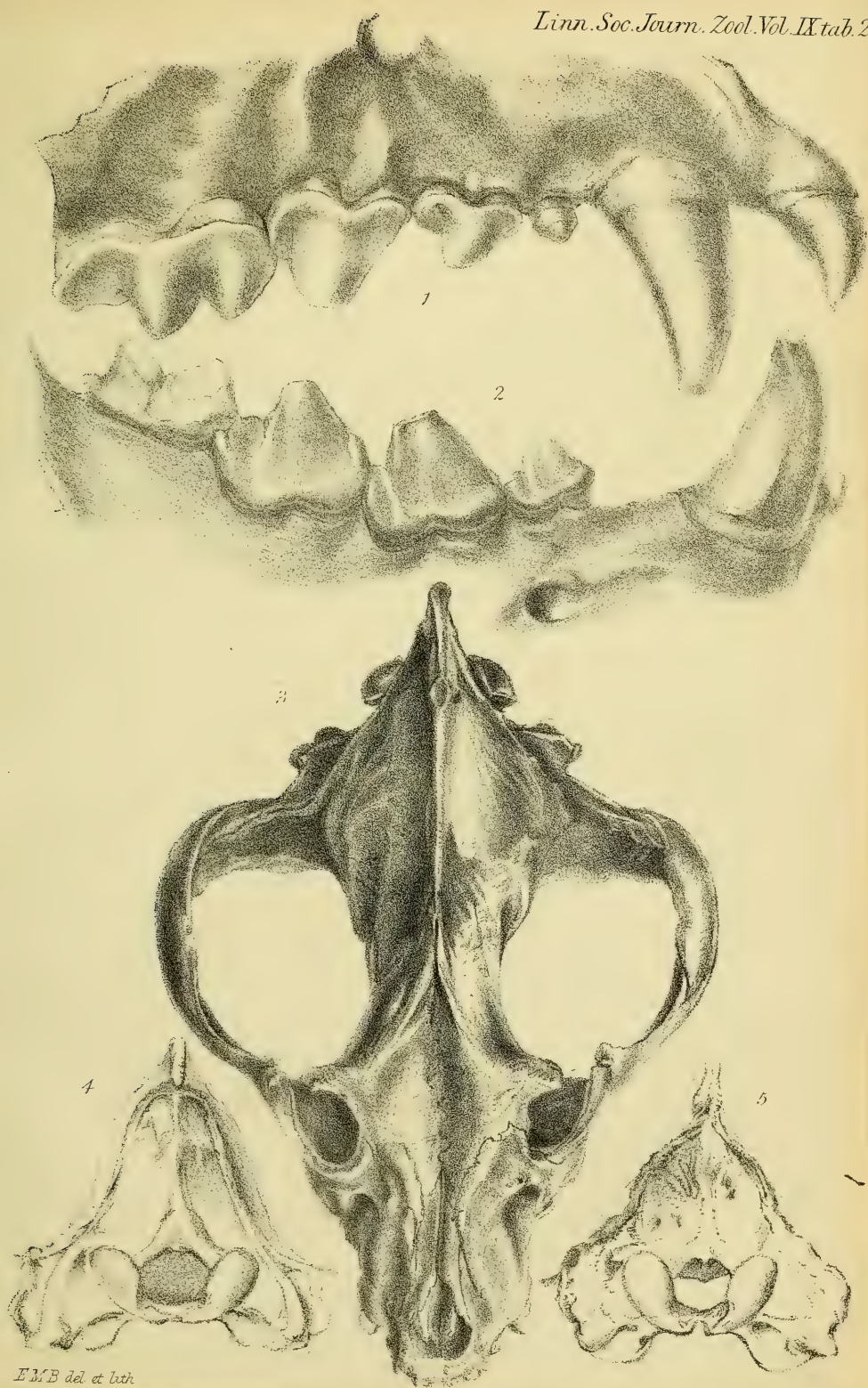
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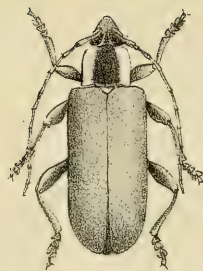
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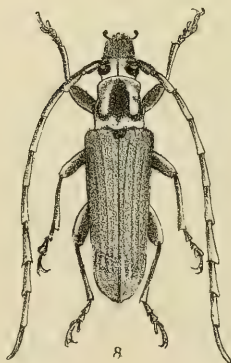
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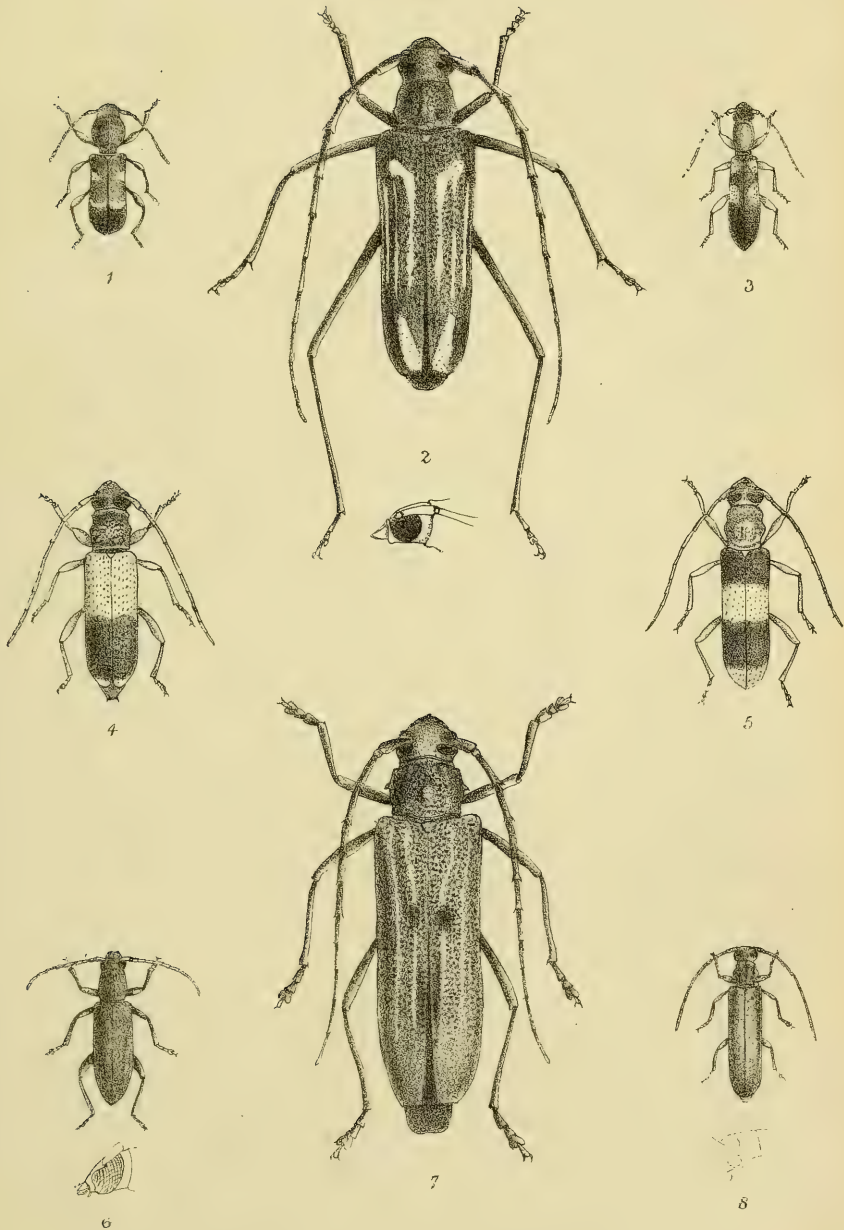


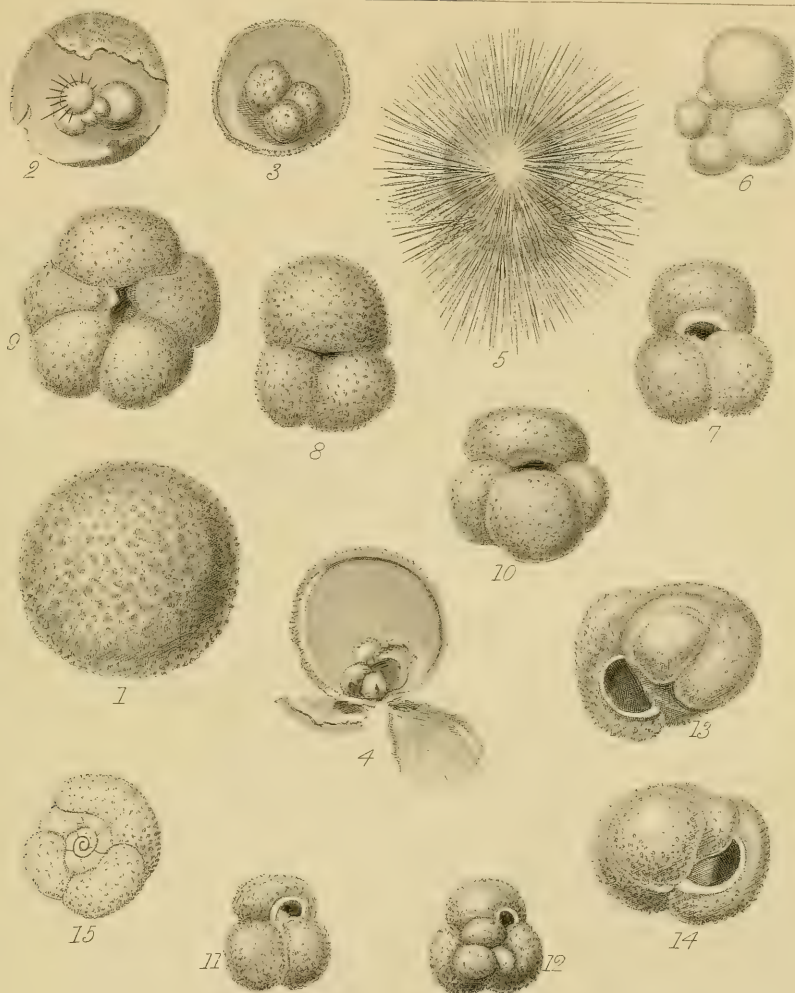
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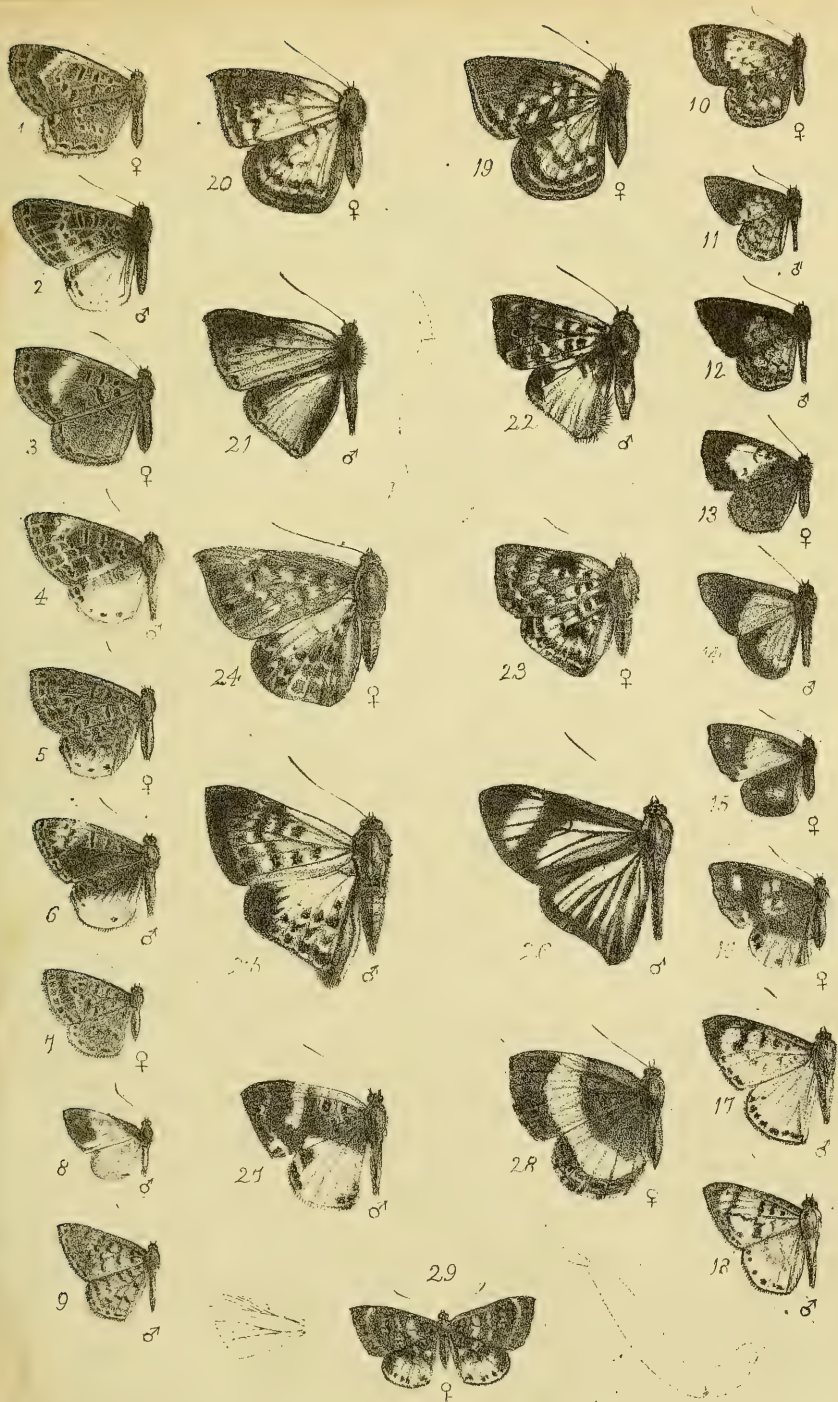




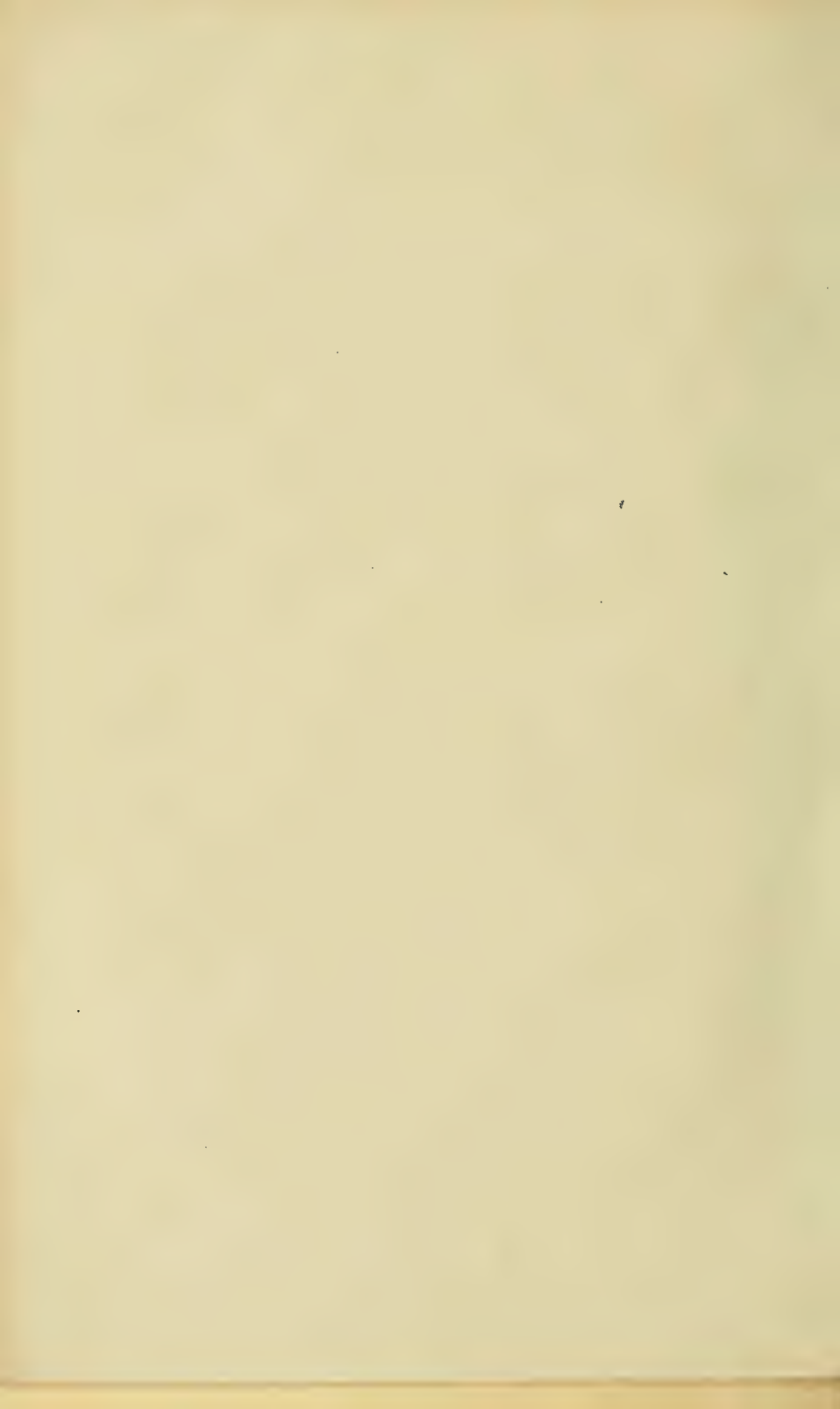
Gen. *Globigerina*.



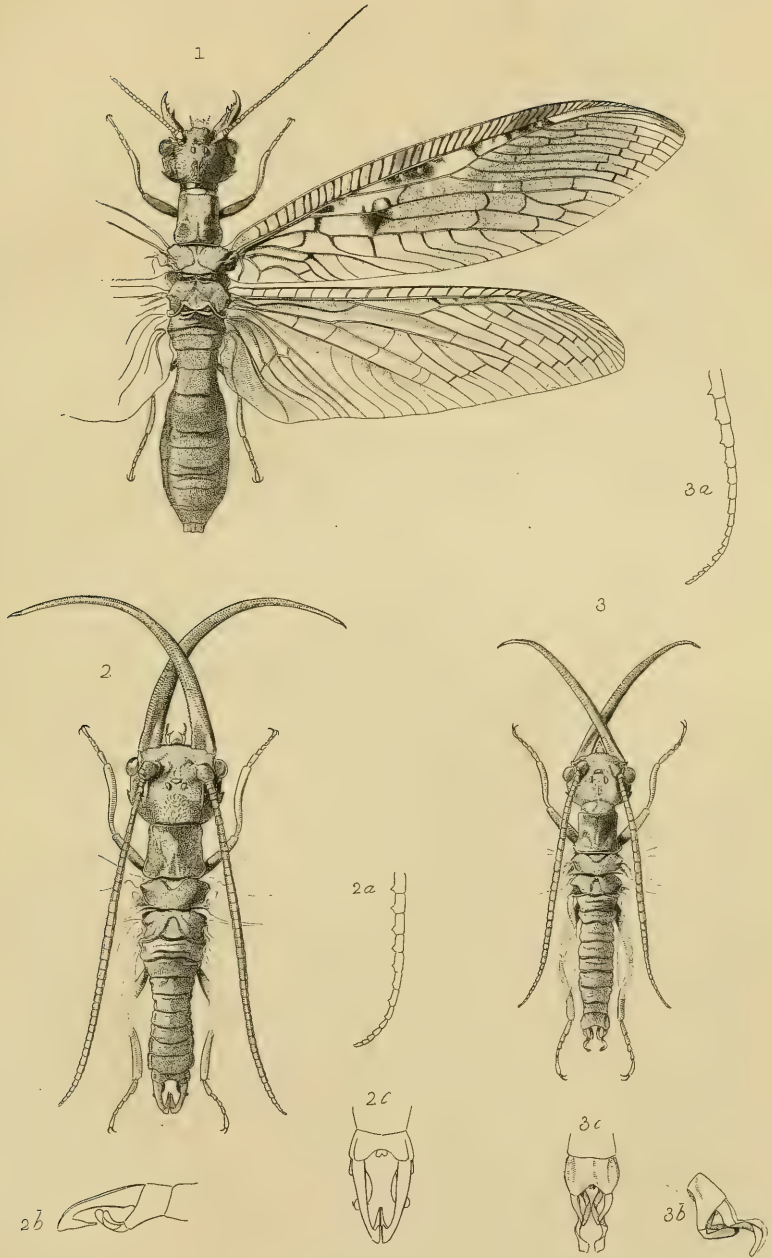
Gen. *Pulvinulina*.



Species of *Leimonias*. &c.







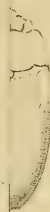
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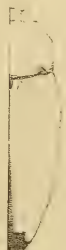
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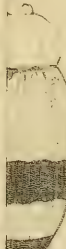
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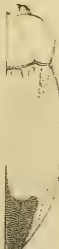
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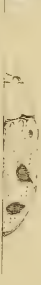
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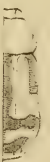
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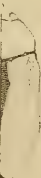
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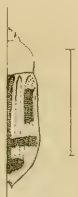
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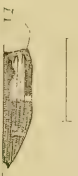
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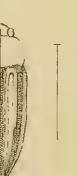
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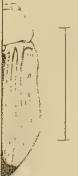
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PROCEEDINGS

OF THE

LINNEAN SOCIETY OF LONDON.

November 3, 1864.

George Bentham, Esq., F.R.S., President, in the Chair.

Henry Stevenson, Esq., was elected a Fellow.

The following Papers were read, viz. :—

1. Letters from Sir Henry Barkly, K.C.B., Governor of the Mauritius, and Swinburne Ward, Esq., Civil Commissioner, in reply to the Memorial of the Linnean Society in March last, relative to the wanton destruction of the Double Cocoa-nut, *Lodoicea Seychellarum*. (See 'Botanical Proceedings,' vol. ix.)

2. "Observations on some Orchids of the South of France;" by John Treherne Moggridge, Esq. Communicated by the President. (See 'Botanical Proceedings,' vol. viii.)

3. "Notes on the Chatham Islands;" by Henry H. Travers, Esq. Communicated by W. T. L. Travers, Esq., F.L.S. (See 'Botanical Proceedings,' vol ix.)

4. "On the Genera *Sweetia*, Spreng., and *Glycine*, L., simultaneously published under the name of *Leptolobium*;" by George Bentham, Esq., Pres. L.S. (See 'Botanical Proceedings,' vol. viii.)

5. "A brief Account of the *Myrmica Kirbii* as found in Southern India;" by John Shortt, M.D., F.L.S. (See 'Zoological Proceedings,' vol viii.)

6. "Account of a Heronry, and Breeding-place of other Water-birds, in Southern India;" by the same. (See 'Zoological Proceedings,' vol. viii.)

November 17, 1864.

George Bentham, Esq., President, in the Chair.

The Hon. John Leicester Warren was elected a Fellow.

Dr. Hooker, V.P.L.S., laid before the Society a lithographed plate of a gigantic species of *Aristolochia*, from the forests of Old Calabar, where it was discovered by the Rev. W. Thomson, of the United Presbyterian Church Mission, and who had transmitted a flower in spirits to Kew. At Mr. Thomson's request, it had been named *A. Goldiana*, after the Rev. H. Goldie. Dr. Hooker hoped to make further observations on it at a future Meeting of the Society. (See Meeting of February 16, 1865.)

Dr. Hooker also exhibited some Hazel-nuts, said to have been taken from a closed cavity of a large oak-tree at Llanelly, in South Wales, and which were supposed to have lain there for many years. The nuts presented a curious striped appearance, and the kernels were quite sound and fleshy, though discoloured. They were sent to Dr. Hooker by Mr. J. Douglas, the proprietor of the saw-mills in which the tree was cut up.

The following Papers were read, viz. :—

1. "Facts relative to the movements of Insects on dry, polished, vertical surfaces;" by John Blackwall, Esq., F.L.S. (See 'Zoological Proceedings,' vol. viii.)

2. "Note on a Skeleton of *Dinornis robustus*, Owen, in the York Museum;" by Thomas Allis, Esq., F.L.S. (See 'Zoological Proceedings,' vol. viii.)

3. "Description of a huge Banyan-tree, *Ficus indica*, which occurs in the Chingleput District, and covers an area of about 4,800 square yards; the number of aerial roots which support the branches, and some of which descend from a height of 60 feet, amounting to about 2000;" by John Shortt, M.D., F.L.S.

4. "On *Pœciloneuron*, a new genus of *Ternstræmiaceæ*;" by Capt. R. H. Beddome, Officiating Conservator of Forests, Madras. Communicated by Thomas Thomson, M.D., F.R.S. & L.S. (See 'Botanical Proceedings,' vol. viii.)

5. "On the Naturalized Weeds of British Caffraria;" by W. S. M. D'Urban, Esq., F.L.S. In a Letter to J. D. Hooker, M.D., V.P.L.S. (See 'Botanical Proceedings,' vol. viii.)

December 1, 1864.

George Bentham, Esq., President, in the Chair.

Henry Gibbs Dalton, M.D., was elected a Fellow.

The following Papers were read, viz. :—

1. "On new Tubicolous Annelides, in the Collection of the British Museum," part 2; by William Baird, M.D., F.L.S. (See 'Zoological Proceedings,' vol. viii.)

2. "On the Structure of *Bonatea speciosa*, L., with reference to its Fertilization;" by Robert Trimen, M. Ent. Soc. Communicated by Charles Darwin, Esq., F.R.S. & L.S.. (See 'Botanical Proceedings,' vol. ix.)

3. "Brief Notice of Results obtained by Experiments with *Entozoa*;" by T. S. Cobbold, M.D., F.R.S. & L.S. (See 'Zoological Proceedings,' vol. viii.)

4. "On the free Nematoids, marine and freshwater, with descriptions of 100 species;" by H. C. Bastian, M.B., F.L.S. (See 'Transactions,' vol. xxv. part 2.)

December 15, 1864.

George Bentham, Esq., President, in the Chair.

Dr. St. Brody, F.L.S., exhibited specimens of the *Ammi glaucifolium*, L. (*A. majus*, γ *glaucifolium*, Gren. & Godr.), gathered

by him on the banks of the Severn, near Gloucester, in September last.

Dr. Short, F.L.S., exhibited four samples of Tea, manufactured from the leaves of Coffee; three of the samples prepared in the Chinese method; the fourth in the mode employed by the natives of Sumatra.

The following Papers were read, viz.:—

1. "On the Tsetse Fly of Tropical Africa (*Glossinia morsitans*, Westw.);" by John Kirk, M.D., F.L.S. (See 'Zoological Proceedings,' vol. viii.)

2. "Description of a new variety of *Lepidonotus cirratus*, parasitic in the tube of *Chætopterus insignis*;" by William Baird, M.D., F.L.S. (See 'Zoological Proceedings,' vol. viii.)

3. "List of Diurnal Lepidoptera, collected by Mr. Wallace in the Eastern Archipelago;" by W. C. Hewitson, Esq., F.L.S. (See 'Zoological Proceedings,' vol. viii.)

4. "On the *Lentibulariæ* collected in Angola by Dr. Welwitsch, A.L.S., with an Enumeration of the African species;" by Professor Oliver, F.R.S. & L.S. (See 'Botanical Proceedings,' vol. ix.)

5. "Notes upon a few of the plants collected, chiefly near Nagasaki, in Japan, and in the Islands of the Korean Archipelago, in the years 1862-63, by Richard Oldham, late Botanical Collector to the Royal Gardens, Kew;" by the same. (See 'Botanical Proceedings,' vol. ix.)

6. "On five new genera of West Tropical Africa, belonging to the Natural Orders *Bixineæ*, *Tiliaceæ*, and *Anonaceæ*; with a note upon the genera *Oncoba* and *Mayna*;" by the same. (See 'Botanical Proceedings,' vol. ix.)

7. "Note on the variety *Trimmeri* of *Potamogeton trichoides*, Cham., found in England;" by Robert Caspary, Prof. Bot., Königsberg, Prussia. Communicated by Dr. Hooker, V.P.L.S. (See 'Botanical Proceedings,' vol. viii.)

8. "Notice of two forms of *Eriophorum angustifolium*;" by

George Dickie, M.D., F.L.S., Prof. Bot., Aberdeen. (See 'Botanical Proceedings,' vol. ix.)

January 19, 1865.

George Bentham, Esq., President, in the Chair.

Archibald Campbell, M.D., Lieut.-Col. Henry Scott, R.E., and John Lindsay Stewart, M.D., were elected Fellows.

The following Papers were read, viz. :—

1. Extract of a Letter from W. H. Brewer, State Geologist to the Survey of California, "On the Forests of *Sequoia (Wellingtonia) gigantea*," addressed to Sir W. J. Hooker, F.R.S. & L.S. (See 'Botanical Proceedings,' vol. viii.)

2. "On *Musa Livingstoniana*, a new Banana from Tropical Africa;" by John Kirk, M.D., F.L.S. (See 'Botanical Proceedings,' vol. ix.)

3. "On the Anatomy of *Doridopsis*, a genus of the Nudibranchiate Mollusca;" by Albany Hancock, Esq., F.L.S. (See 'Transactions,' vol. xxv. part 2.)

February 2, 1865.

George Bentham, Esq., President, in the Chair.

The Rev. Robert Whitaker M'All, and Captain Douglas Galton, R.E., were elected Fellows.

The following Papers were read, viz. :—

1. "On the Movements and Habits of Climbing Plants;" by Charles Darwin, Esq., F.R.S. & L.S. (See 'Botanical Proceedings,' vol. ix.)

2. "Note on the Genera *Darwinia*, Rudge, and *Bartlingia*, Ad. Brongn.;" by George Bentham, Esq., Pres. L.S. (See 'Botanical Proceedings,' vol. ix.)

February 16, 1865.

George Bentham, Esq., President, in the Chair.

The following Papers were read, viz. :—

1. "Notes on *Pueraria*, DC., correctly referred by the author to *Phaseoleæ*;" by George Bentham, Esq., Pres. L.S. (See 'Botanical Proceedings,' vol. ix.)

2. "Notice of some Vegetable Monstrosities;" by George Dickie, A.M., M.D., F.L.S., &c. (See 'Botanical Proceedings,' vol. ix.)

3. "Note of Observations and Experiments on Germination;" by the same. (See 'Botanical Proceedings,' vol. ix.)

4. "Descriptions of some new and remarkable species of *Aristolochia* from Western Tropical Africa;" by J. D. Hooker, M.D., F.R.S., V.P.L.S. (See 'Transactions,' vol. xxv. part 2.)

5. "The *Diatomaceæ* of Otago, New Zealand;" by W. Lauder Lindsay, M.D., F.L.S. (See 'Botanical Proceedings,' vol. ix.)

March 2, 1865.

George Bentham, Esq., President, in the Chair.

Balthazar Walter Foster, M.D., and John Jenner Weir, Esq., were elected Fellows.

The following Papers were read, viz. :—

1. "On the Surface-fauna of Mid-ocean.—No. 1. *Polycistina* and allied Rhizopods;" by Major Samuel R. J. Owen, H.M. Bengal Army. Communicated by Dr. Baird, F.L.S. (See 'Zoological Proceedings,' vol. viii.)

2. "On a new Dye-wood of the genus *Cudranea*, from East Tropical Africa;" by John Kirk, M.D., F.L.S. (See 'Botanical Proceedings,' vol. ix.)

3. Letter from Mr. C. A. Wilson, containing Observations on the Natural History of South Australia; including a numerous

List of Birds from the Northern parts of the Province. Communicated by the Secretary.

March 16, 1865.

George Bentham, Esq., President, in the Chair.

Isaac Anderson Henry, Esq., Joseph William Morris, Esq., and Edwin Morritt Williams, Esq., were elected Fellows.

The President announced that tidings had been received of the Death of Heinrich Schott, Director of the Imperial Garden at Schönbrunn, who had been proposed as a Foreign Member on the 2nd of February.

The following Papers were read, viz.:—

1. "Notes on Lichens collected by Sir John Richardson in Arctic America;" by the Rev. William Allport Leighton, B.A., F.B.S.E. Communicated by J. D. Hooker, M.D., F.R.S., V.P.L.S. (See 'Botanical Proceedings,' vol. ix.)

2. "Palms of East Tropical Africa;" by John Kirk, M.D., F.L.S. (See 'Botanical Proceedings,' vol. ix.)

3. "Descriptive List of Plants of the Anamallay Hills, in the Madras Peninsula;" by Captain R. H. Beddome, Officiating Superintendent of Forests. Communicated by Thomas Thomson, M.D., F.R.S. & L.S. (See 'Transactions,' vol. xxv. part 2.)

April 6, 1865.

George Bentham, Esq., President, in the Chair.

Thomas W. V. Beckett, Esq., Captain Samuel Richard John Owen, Richard Milne Redhead, Esq., and Captain Willoughby Sandilands Rooke, were elected Fellows.

The following Papers were read, viz.:—

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1. "Notes on the Flora of the Desert of Sinai;" by R. M. Redhead, Esq., F.L.S. (See 'Botanical Proceedings,' vol. ix.)

2. "On the Vegetation of the Western and Southern Shores of the Dead Sea;" by B. T. Lowne, Esq. Communicated by J. D. Hooker, M.D., F.R.S., V.P.L.S. (See 'Botanical Proceedings,' vol. ix.)

April 20, 1865.

George Bentham, Esq., President, in the Chair.

The following Papers were read, viz. :—

1. "On *Gripidea*, a new Genus of the *Loasaceæ*; with an account of some peculiarities in the Structure of the Seeds in that Family;" by John Miers, Esq., F.R.S. & L.S. (See "Transactions," vol. xxv. part 2.)

2. "Lahul, its Flora, Vegetable Products, &c., from communications received from the Rev. H. Jaeschke, of the Moravian Mission;" by E. T. Aitchison, M.D., F.L.S. (See 'Botanical Proceedings,' vol. ix.)

May 4, 1865.

George Bentham, Esq., President, in the Chair.

Frederick Welwitsch, M.D., and William Woolls, Esq., were elected Fellows.

Mr. Redhead, F.L.S., exhibited dried specimens of Plants collected in Palestine and the Desert of Sinai; also specimens of the "Rose of Jericho" (*Anastatica hierochontica*), living and in the dried state.

The following Papers were read, viz. :—

1. "On two species of *Guttiferæ*, *Calysaccion siamense*, Mig., and a *Garcinia* from the East Coast of Africa;" by Thomas Anderson, M.D., F.L.S.

2. "Descriptions of some new Genera and Species of Tropical *Leguminosæ*;" by George Bentham, Esq., F.R.S., Pres. L.S. (See 'Transactions,' vol. xxv. part 2.)

The President announced that a new part of the 'Transactions' (vol. xxv. part 1), consisting of Mr. Wallace's Paper "On the Phenomena of Variation and Geographical Distribution, as illustrated by the *Papilionidæ* of the Malayan Region," was now ready for distribution.

May 24, 1865.

Anniversary Meeting.

George Bentham, Esq., President, in the Chair.

This day, the Anniversary of the Birth of Linnæus, and the day appointed by the Charter for the Election of Council and Officers, the President opened the business of the Meeting with the following Address:—

GENTLEMEN,

IN laying before you the annual statement of our progress, we have not had to report to you that addition to our funded property which had of late years become usual; for several important papers requiring expensive illustrations had been read at your meetings, the publication of which the Council considered that they ought not to delay, although entailing more than double the usual outlay on this head. They accordingly suspended the investments, which in the preceding year had been exceptionally large, and after having published at the usual period a part of the Transactions of unprecedented extent, they have now issued an extra part devoted to Mr. Wallace's valuable paper on variation and distribution of species, as illustrated by the *Papilionidæ* of the Eastern Archipelago; and the materials already in hand for the usual issue next November show that our publications for the new year will be fully up to the ordinary average. I am happy to be able to add that our labours in this direction have been so well appreciated in distant lands, that they have procured for us considerable additions to our numbers amongst working naturalists

in our colonies and dependencies, especially in Australia, New Zealand, and East India.

Our Library has received the usual additions ; the works presented have been numerous and important, and a sum of about £75 has been laid out in the purchase and binding of books. I last year mentioned that the Council were taking measures for printing a general Catalogue. This work, necessarily slow on account of the minutiae of detail requiring careful attention to secure accuracy, is now progressing ; the whole has been arranged and written out for press ; it is in type as far as the letter G, and we trust that it will be ready for publication early in autumn.

In looking over this Catalogue and the shelves of our library, it will be observed that a large proportionate space is occupied by Transactions of scientific bodies and scientific journals more or less devoted to Natural History. This is, however, a class of works of which we consider it essential for a Society like ours to make as complete a collection as possible. Occupying much room in the shelves, and only wanted for occasional consultation, they are out of the reach of most private libraries, and yet every working naturalist must feel how essential it is for him that there should be some deposit where he can have ready access to them when these occasions occur. The Council have therefore always felt it to be in the interest of the Society to be liberal in accepting the proffered intercourse with such of the principal scientific bodies abroad as really include Zoology and Botany in the subjects they treat of ; and the practical value of the works so obtained will now be much enhanced by the important indexes preparing by the Royal Society. The Linnean Society are in direct exchange of Transactions or Proceedings with no less than eighty-three Academies, Institutes, or Societies at home and abroad, and are in regular receipt, by purchase, exchange, or presentation, of sixteen zoological or botanical periodicals. The comparative value of these works to our Fellows is of course much varied. Few only are devoted exclusively to our own sciences, and in many cases the natural-history papers are so widely scattered in the mass of physical or mathematical subjects, or even of historical and general literature, that they are apt to be entirely overlooked. They are written, moreover, in fourteen different languages, which it can hardly be expected that we should all of us learn, even so far as to spell out with the help of a dictionary. Besides the conventional Latin, the English, French, and German are indeed now essential languages for every true scientific naturalist. With the help of

Latin and French, Italian and Spanish may be made out sufficiently for our purpose. A general study even of Portuguese and Dutch may, in some branches of our science, be repaid by the materials it would bring to our use. But we may surely be justified in concluding that papers written in Danish, Swedish, Russian, Bohemian, and Hungarian are intended for the sole use of the inhabitants of those countries, and that the general naturalist need to take no notice of them, unless the technical characters at least are in Latin. We have none yet, I believe, in modern Greek or in Turkish; but the time may not be distant when projects of learned Societies at Athens and Constantinople may be realized, and we may have Transactions, even in those languages, offered in exchange for our own.

My attention having thus been called to this class of works, it has appeared to me that a few notes on the subject might not be unacceptable to such of our Fellows as have occasion to consult our library, and might assist in that general survey of the progress of our science to which I am always desirous that my annual addresses should contribute. For this purpose I shall endeavour to pass in review the most important Natural-History Transactions and Journals now publishing, taking the different nations rather according to languages than in a strict geographical or political order. Commencing, therefore, with the Scandinavian, *i. e.* the Danish, Norwegian, and Swedish Academies and Societies, and proceeding with the East European, *i. e.* the Russian, Polish, Bohemian, and Hungarian, I shall then take the Italian, the Spanish, and those of the transmarine states or colonies, making use of their language, the Portuguese and Brazilian, the Dutch, and those of their colonies, the German and the French, concluding with our own and those of the transmarine countries once or still our colonies, who have retained or adopted our language. In this review, however, I have no pretension to giving any complete bibliography, but have confined myself, with few exceptions, to our own and the Royal Society's libraries at Burlington House, and to those works only where Zoological or Botanical papers would naturally be sought for, without seeking even for any stray ones which may have found their way into the Transactions of Medical, Agricultural, or other allied institutions.

1. DENMARK.

The early publications of the COPENHAGEN Academy of Literature and Science contain but very few papers on Natural History;

but in 1790 was commenced a series of Transactions, either of the Natural History Society or of the Natural History and Mathematical Branch of the Royal Danish Society of Science, which, under various titles, has been continued to the present day, comprising many important papers which we have frequently to consult, chiefly on plants, insects, and the lower orders of animals. The first set was in 8vo, and appears to have been the work of a body distinct from the Royal Danish Society, being entitled *Skrivter af Naturhistorie Selskabet*. Five volumes were regularly published up to 1799, after which it was much interrupted. The last part of the fifth volume appeared in 1802, and in 1810 it was closed with a thin volume and general index. The chief writers in the six volumes were the great Danish Naturalists of the day—Vahl, Abildgaard, Spengler, Fabricius, Lund, Rathke, Schumacher, Schousboe, and Holten—besides Thunberg, who distributed his papers to most of the Societies of Northern Europe. As this Society expired, a few papers of the kind were laid before the Royal Danish Society, in whose second series of Transactions, entitled *Det Kongelige Danske Videnskabernes Selskabs Skrivter*, six vols. 4to, from 1800 to 1818, we have various papers by Fabricius on Greenland Zoology, by Schousboe on the Zoology and Botany of Morocco, and Rafn's Researches on the Vital Powers in Organic Nature, mixed in with a great variety of other sciences. In 1824 they separated Physical, Mathematical, and Natural Science from History and Literature; and in the 12 volumes from that year to 1846, entitled *Det Kongelige Danske Videnskabernes Selskabs Naturvidenskabelige og Mathematiske Afhandlingar*, are contained Schumacher's description of Thonning's Guinea plants, occupying the half of two volumes, and some zoological papers by Fabricius, Hornemann, Reinhardt, Kröyer, Ørsted, &c., including much relating to Greenland Zoology, besides Eschricht's contributions to Zoological Anatomy and Lund's series of papers on the Zoology and Vegetation of Brazil. A new series, under the title of *Det Kongelige Danske Videnskabernes Selskabs Skrifter*, femte række (5th series), was commenced in 1849, and is, I believe, still carried on, although the last volume received (the fifth) is dated as far back as 1861. The principal zoological contributions are from Eschricht, Steenstrup, Prosch, Bergh, Kröyer, J. Reinhardt, Luetken, and Meinert. In Botany we have only Schouw's geographical distribution of Italian Oaks and Birches; Liebmann's Mexican Ferns, Cyperaceæ, *Phileteria*, and Urticaceæ, and Ørsted's Central American Gesneriaceæ. This last

series is exceedingly well got up as to typographical execution ; and the plates, which are numerous, are fully equal to the best of European illustrations in point of neatness and clearness of detail. Unfortunately the majority of the papers are in Danish, at least as to general matter, observations, and explanations ; and in some cases that language is used even for generic and specific characters, rendering them useless to the majority of naturalists until they shall be translated into Latin by German compilers. There is also some confusion in referring to the Transactions, owing to the different series being distinguished only by slight alterations in the wording of the titles—further increased by the frequent custom in general systematic works of translating into Latin the titles of the works quoted.

These quarto Transactions appear now to be partially superseded by octavo Proceedings, commenced in 1842, as Oversigt over det Kongelige Danske Videnskabernes Selskabs Forhandlingar, and continued in a thin annual volume to 1863, the last received. At first these Proceedings only contained the Reports of the Meetings, and very short communications on Antiquities, Meteorology, Mathematics, &c., with a little Natural History : latterly papers of this class have been rather more extended, and a few plates given ; the last part, for instance, for 1863, contains one plate illustrating Ersted's paper on a *Neea* supplying tea in Central America, one with Reinhardt's paper on *Rachiodontidæ*, and another, as well as several woodcuts, with Steenstrup's *Pleurometides*.

An octavo Journal of Natural History had also been started in Copenhagen by Krøyer, under the title of *Naturhistorisk Tidsskrift* ; four volumes in 8vo, from 1837 to 1843, completed a first series, and two volumes formed a second series from 1844 to 1849, with a satisfactory index to each series. The papers are chiefly zoological, many of them Krøyer's own, on Crustacea and Fish, the others mostly on Mollusca, Insects, and other lower orders, or relating to the Danish Fauna ; the botanical papers are very few, and only on the Danish Flora. This Journal was renewed in 1861 by Professor Schiödte under the title of *Naturhistorisk Tidsskrift* stiftet af Henrik Krøyer, adgivet af Prof. S. C. Schiödte, and is now in its third volume. It is illustrated with beautiful plates, and contains, amongst others, valuable entomological papers by Schiödte and by Krøyer, on *Serpulidæ* by O. Mörch, and on the Anatomy of Nudibranchiate Mollusca by Berg.

To Danish Transactions must be referred also those of the Norwegian Societies of CHRISTIANIA and DRONTHEIM, all written in Danish, and printed for the most part at Copenhagen. These are the Trondjemiske Selskabs, afterwards Kongelige Norske Videnskabers Selskabs Skrivter, 5 vols. from 1761 to 1774; the Nye Sammling of the same, 7 vols., from 1784 to 1799, and two other series from 1817 to 1832, and from 1832 to 1846, the earlier ones with a few papers on Norwegian Zoology and Botany, very rare, or none at all in the later ones; the Magazin for Naturvidenskaberne, edited at Christiania, at first by G. F. Lundh, C. Hansteen, and H. H. Maschmann, afterwards by the Physiographiske Forening i Christiania, extends to ten thin volumes, octavo, 1823 to 1828, with a second series of two volumes, 1831 to 1836; the Nyt Magazin for Naturvidenskaberne udgives af den Physiographiske Forening i Christiania, in 9 vols. 8vo, without plates, closing in 1856, a work devoted to Natural History, but the papers relate almost exclusively to that of Norway and chiefly to its Geology; and lastly, the Annual Reports of the Norwegian University, entitled Kongelige Norske Frederiks Universitets Aarsberetning from 1856 to 1859. Much information is contained in these collections which might be useful to us as relating to a country so nearly connected in a physiological point of view with our own; but it is only those who are very familiar with the language who could find it worth while to seek for it amongst the mass of irrelevant matter with which it is mixed.

The Tidsskrift for Naturvidenskaberne, edited at COPENHAGEN by H. C. Örstedt, J. W. Hornemann, and J. Reinhardt, in five volumes octavo, from 1822 to 1828, contains but very little Zoology and Botany, and that chiefly local.

The Videnskabelige Meddelelser fra den Naturhistoriske Forening i Kjöbenhavn, or Scientific Contributions of the Natural History Society of Copenhagen, published in parts in 8vo, with a few plates, appears to form annual volumes devoted to Zoology as well as to Botany. I have only seen a few Numbers, in which are contained botanical papers chiefly on the Central American Flora, by Örsted, and extending from 1849 to 1863. There is no complete set in our libraries.

II. SWEDEN.

The Royal Society of Sciences of UPSALA appears to have been established in 1710, but to have published very little until 1744, when, chiefly under the influence of Linnæus, the Acta Regiæ Socie-

tatis Scientiarum was commenced in 4to, interrupted in 1751, resumed in 1773 under the title of *Nova Acta Regiæ Societatis Scientiarum*; and a new series commenced in 1851 is still continued. The early volumes were few and frequently interrupted, containing, amidst a great number of physical, historical, and mathematical papers, a few on Natural History by Linnæus, De Geer, and others; and towards the close of last century, and in the first years of the present one, there are numerous papers of Thunberg's, and a few from Swartz, Sparmann, Oedmann, J. E. Smith, Wahlenberg, and Forsberg. After the death of Thunberg to the close of the series in 1850, there are no more zoological papers, and very few botanical ones, chiefly bryological by Ångström, phycological by Areschoug, and by Fries on *Hieracium*. The 11th volume, however (1839), contains, under the name of *Loca Parallela Plantarum*, an interesting review by Lestadius, a Lapland Pastor, of the variations of species attributable in those northern regions to local circumstances. The recent volumes forming the new series since 1851 comprise, in Zoology, papers by Liljeborg on Crustacea, Thorell on Araneæ, Smitt on the Ehippides des Daphnies, and Stål on Chrysomelides; and in Botany, Areschoug on Phyceæ, Fries on Fungi, Lichens, and others, Anderson on Andropogoneæ, and a Monograph of Fumarias by Hammer. These Transactions have the advantage of being written entirely in Latin and French, and the plates illustrating them are generally well executed.

The long series of Transactions of the STOCKHOLM Academy, known by the Latin name of *Acta Academiæ Holmensis*, but to which I only find the Swedish title of *Kongliga Svenska Vetenskaps Akademiens Handlingar*, are in 8vo, a thin volume having appeared almost every year from 1744 to 1854, with a fair proportion of Natural History, considering the great variety of sciences admitted. Taking the volumes since 1850, the zoological papers are chiefly entomological by Dahlbom, Naumann, Boheman, Zeller, Holmgren, C. Thomson, Stenhammer, &c., with some by Liljeborg on Crustacea and on Norwegian Zoology generally; the botanical ones comprise Anderson's Galapagos Flora and Indian Salices, Wallmar on Characeæ, a little-known enumeration of the plants of Portobello, in Panama, with descriptions of many new species by Beurling, under the title of *Primitiæ Floræ Portobellensis*, and Hartmann's notes on the Scandinavian plants of the Linnean Herbarium, made in our library, and which it would be of importance for us to have in English.

In 1855 the form was changed, and a new series commenced

under the title of Kongliga Svenska Vetenskaps Akademiens Handlingar, Ny Följd (new series), of which the last received is a part of the 4th volume, dated 1862. The typographical execution and illustrations in these volumes are good; a separate paging is adopted for each memoir, as in several of the most recent Transactions of other countries. The Natural History is chiefly zoological: Sundevall on the development of Fish-spawn, on the birds of the Carlson Museum, and of Vaillant's Oiseaux d'Afrique, on Aristotle's Animals, on Insect Anatomy; Holmgren on Swedish Tryphonidæ, Ophionidæ, and Ichneumonidæ; Wallengren on Scandinavian Alucita, and on Wahlberg's South African diurnal Lepidoptera; Stål on Brazilian Hemiptera, Bruzelius on Scandinavian Amphipoda, Thorell on Crustacea parasitic in Ascidia, and Grill's account of Victorin's zoological discoveries in South Africa. The only botanical paper is by the younger Agardh, on the position of the Ovule in Phanerogams.

The publication of octavo Proceedings by the same Society, in thinner and more frequent parts, commenced for 1844, and the last Numbers we have received are those for 1862. They are entitled Öfversigt af Kongl. Vetenskaps Akademiens Förhandlingar; they comprise minutes of meetings, abstracts of papers, and entire short papers with occasional illustrations, the physical, mathematical, and Natural-History subjects following each other without order. In the first volumes the papers were, in the table of contents, classed according to subjects; but after 1854 even that help to consultation was given up. The Natural-History papers relate chiefly to the Fauna and Flora of Sweden, with a few new general ones on Entomology and the lower orders of plants, besides those descriptive of the zoological results of Wahlberg's South African Expedition, and the Zoology and Botany of Malmgren's Spitzbergen collections. There is also an account, of some interest to ourselves as the chief possessors of Linnean treasures, of a good set of specimens of Lapland plants, types of the Flora Lapponica, named and laid down by Linnaeus, and presented to Burmann, in whose herbarium, in Delessert's Museum in Paris, it now remains in good condition. The Plates in these Proceedings increase in number in the later volumes; in that for 1862, for instance, there are eight, illustrating Widegren's Memoir on Swedish Salmonidæ.

The detailed Annual Reports on the Progress of Science, undertaken by the officers of the Academy, were carried out with great pains and perseverance for many years, and would have been

extremely useful had they been drawn up in any language of extensive circulation. They were commenced in 1821, for the year 1820, under the title of *Årsberättelsen om Vetenskapernes Framsteg afgivne af Kongl. Vetenskaps Akademiens Embetsmän*, under the four different heads of Chemistry and Physics, Astronomy and Mathematics, Zoology, and Botany. Zoology by Dalman, and afterwards by Sundevall, and in the later volumes subdivided between Sundevall, Boheman, and Lovén, was continued for thirty-five years, ceasing in 1855 and 1856. Botany by Wikström was carried on till the close of his life in 1849, and an excellent index up to 1838 added by Anderson. These botanical reports were generally translated into German by Beilschmid; but some time naturally elapsed before the translations appeared, and the reports were too wordy to retain their interest when old. They appear now to have been entirely given up. The plan is an excellent one, and has since been carried out for Zoology as mentioned below in Wiegmann's *Archiv*, in a more suitable language. The great drawback, indeed, to the whole of the scientific publications of the Stockholm Academy is the use of a language limited for general purposes to a moiety of the Scandinavian Peninsula, and totally unknown to the great majority of the scientific world. Linnaeus himself was accustomed to give in Latin whatever he considered to be of more than local interest.

The Royal Society of Science and Literature of GÖTEBORG, after having published a few thin octavo parts of old Transactions, commenced a new series in 1808, which extended to five thin parts in small octavo, 1808 to 1822, under the title of *Nya Handlingar af Kongl. Vetenskaps och Vitterhets Samhället i Göteborg*, containing, amongst a few others, several papers on the Fishes of the Bohusland with coloured plates. Again, in 1850, the present series was commenced in octavo, with much-improved typography, entitled *Göteborg's Kongl. Vetenskaps och Vitterhets Samhälles Handlingar*, Ny Tidsföld. It extends to eight thin volumes, the last dated 1863, and comprises, amidst Literature, Physics, &c., several papers on the Swedish Fauna, especially Fish, Insects, and Mollusca, but very little Botany.

Of the *Physiographiska Sällskapets Tidskrift*, 8vo, LUND, I have only seen a first volume, dated 1837–38, containing a paper of some length on East-Indian Birds by Sundevall, besides short papers on the local fauna and flora, mathematical and other subjects.

The Finland Society of Science at HELSINGFORS, although

politically in the Russian dominions, may be mentioned here as using the Swedish language. Of their Transactions there are in the library of the Royal Society four volumes in 4to (one a double one), from 1840 to 1856, under the title of *Acta Societatis Scientiarum Fenniaë*. They contain, besides contributions to local Natural History, papers by Vahlberg on Brazilian Coleoptera, by Ilman on Adriatic Medusæ, and a monograph of *Eriophorum* by Nylander. There is also a Finnish Society, which has published a few octavo volumes of Transactions limited to the Fauna and Flora of Finland.

III. RUSSIA.

The Transactions of the Academy of Sciences of St. PETERSBURG commenced in the year 1726, in 4to, as *Commentarii Academiæ Imperialis Scientiarum Petropolitanaë*. Fourteen volumes appeared up to 1746, when the title was changed to *Novi Commentarii*, and continued through twenty volumes to 1775. A third series, entitled *Acta Petropolitana*, in twelve parts, brought them down to 1782; a fourth, as *Nova Acta Petropolitana*, from 1783 to 1802, in fifteen volumes; and a fifth, in ten volumes, from 1803 to 1822, as *Mémoires de l'Académie Impériale des Sciences de St. Pétersbourg*, the general title still retained for the publications of the Academy. In 1830, however, in commencing the sixth series, the Sciences *Mathématiques, Physiques et Naturelles* were separated from historical and literary matter; and, besides that, a distinct series of volumes was commenced for *Mémoires présentés par divers Savans*, not members of the Academy. Every year also a thin volume was published, entitled *Recueil des Actes de la Séance publique de l'Académie*, held usually in December, containing the minutes of the Anniversary meeting, a report on the progress of science by the Secretary, and occasionally some scientific paper by way of Appendix. The part for 1831 includes a detailed enumeration and general *résumé* in German, by Brandt, of all the zoological papers contained in the seventy-two volumes of the Transactions up to that date, and that for 1834 a review by Bongard of all that had been done up to that time in Russia in Botany.

This sixth series lasted till 1859, but with various modifications. In the first two volumes (1830-33) Physics and Mathematics were mixed with Natural Sciences. In the following year the latter were separated; and soon after, a separate paging was adopted for Zoology and Botany. The eight volumes concluding

in 1859 are more than two-thirds zoological, chiefly by Brandt, Ménétrés, Parrot, and Middendorf, including Baer's Illustrations of Human Craniology,—the botanical portion consisting chiefly of well-known papers by Trinius, Bongard, Ruprecht, and C. A. Meyer. The nine volumes of the *Mémoires des Savans Étrangers*, from 1830 to 1859, with a good proportion of mathematical and physical sciences, comprise extensive contributions on insects by Count Mannerheim, Nordman, Motchoulsky, and Faldermann; on Crustacea and Mollusca by Seb. Fischer and Gerstfeld; on Fish by Girgensohn, and on Chilian Birds by Kittlitz; besides anatomical and others connected with zoology by W. Gruber and Baer. In Botany they contain Meyer on Cyperaceæ, Bunge on Chinese Plants, Fritsche on Pollen, Besser's *Artemisias*, Basiner's *Hedysarum*, Schleiden's Anatomy of Cacti, and Maximovitsch's Flora of the Amur.

From 1859 a new plan has been adopted. The memoirs have each a separate paging and title, and are separately sold, and for those who prefer keeping the whole together, they are arranged in volumes in the order of publication, without reference to subjects, each volume having its title-page and table of contents. Up to the present time the Natural-History papers have been chiefly geological or on human physiology; those on zoology and botany make up two or three volumes, and consist of the following:—in Botany, Regel on Parthenogenesis, and on the Flora of the Ussuri; Borszczow (or Borshtshoff) on Calligoneæ, and on the Aralo-Caspian Pharmaceutical Ferulaceæ; and Bunge's Revision of Anabaceæ; in Zoology, Paulsen on the Anatomy of *Diplozoon paradoxum*, Strauch on Algerian Erpetology, Weiss on the Oology of Rotatoria, Volborth on some Russian Trilobites, Morawitz's Contributions to the Coleopteral Fauna of the Island of Jesso, Ossiannikof on the structure of the cerebral ganglions in Crustacea, Knoch on the Tapeworm, and Strauch on the Tortoises of the Academy's Museum.

These Transactions are generally well got up; the plates are good, but sometimes, compared to the Danish and Parisian ones, rather coarse, or on too large a scale. The languages allowed are Russian, Latin, French, and German. Fortunately the Russian papers are confined to national, ethnological, or historical subjects, or that language is at most allowed to intrude into the habitats and stations in the descriptive papers. The great majority are in German or French, with Latin technical characters.

The Imperial Academy has, like many others, responded to the

general demand in the present day for reports of their proceedings ; but they have adopted the inconvenient large quarto form, which for this purpose is quite unnecessary. They publish a Bulletin de l'Académie Impériale des Sciences de St. Pétersbourg, commencing from 1859, and forming each year a volume of six to ten Numbers. It contains the reports of proceedings, together with short papers complete, and a few plates. All sciences are necessarily mixed in this Bulletin, and several contributions are in the Russian language ; but the zoological and botanical are, as in the Transactions, chiefly in French or German, with Latin technical characters. The most important are, in Zoology, Baer's papers on palæontological subjects ; Entomology by Motehousky, Bremer, and Morawitz, Grube on Araneids, Schenck on Mollusca, and Strauch on two new Saurian Reptiles ; and in Botany, Maximowitsch on *Golowninia*, Fritzsche on the Seeds of *Peganum*, Ruprecht on Caucasian *Primulas*, and Bunge on *Echinops*.

The Entomological Society of St. PETERSBURG have published two parts in large octavo with plates, forming together a thin volume of a work entitled Horæ Societatis Entomologicæ Rossicæ, the first part having appeared in 1861, the second in 1863. The papers are of course exclusively entomological, and are drawn up in French, German, Latin, and Russ.

The Société Impériale des Naturalistes de Moscou was founded in 1805, and soon after commenced publishing quarto memoirs with plates, on Zoology, Botany, Mineralogy, and kindred sciences. Four volumes had been issued at the time of the catastrophe of 1812, which destroyed the whole unsold stock, including the greatest part of the impression of the fourth volume, and all that was ready of the fifth ; the latter volume, however, was reprinted after the peace, with funds contributed by two brothers, Chevaliers Zosima, and a sixth volume appeared in 1823. In 1829 a new series was commenced, entitled Nouveaux Mémoires, of which there are thirteen volumes from that year to 1861. Besides a few chemical, physical, and geological contributions, the papers are chiefly on the fauna and flora of the Russian dominions. The most important on exotic subjects are on insects, or the lower orders of animals—Eichwald on the Algerine and Atlas faunas, Basilewitz on North Chinese fish, Buhse's Transcaucasian plants, Regel's Monograph of Betulaceæ, and Körnicke's of Marantiaceæ. Of these memoirs there is not quite a complete set at Burlington House. The Royal Society have the first four volumes, the Linnean have the fifth of the first set, and of the second set the third

and fourth are in both libraries; from the seventh to the last issued (part of the thirteenth, 1861), in the Linnean only.

With the *Nouveaux Mémoires* the Society commenced in 1829 an octavo *Bulletin*, destined for reports of proceedings and short papers not requiring quarto illustrations; and this has continued to the present time, gradually increasing in the length of papers and consequent bulk, with the occasional addition of a very few plates. Up to the fifteenth volume (1842) one volume a year was published; since that two parts have appeared for each year, each one forming a fair-sized volume, with a separate paging, the last received being the first of the volume for 1864. This long series, with a fair proportion of Geology and Physics, comprises much that is valuable on the fauna and flora of the vast Russian empire, including its recent acquisitions on the lower Amur, and occasionally short general monographs or descriptions of exotic productions. Taking the last three years, we have a description of Ceylon insects by Motehoulsky, a continuation of the monograph of *Marantiaceæ*, begun by Körnicke in the *Nouveaux Mémoires*; an account, by Massalongo, of some New Zealand lichens, illustrated by neatly coloured plates, but, as I understand, wrongly placed as to genera and affinities, and the last, it is to be hoped, of a series of papers by the late Turczaninow (*Turtshaninoff*) on the supposed new or little known plants of the herbarium of the University of Charkoff, formerly his own. In former volumes Turczaninow had published a detailed flora of the Baical-Dahurian region, the result of his own investigations, and he had extensively and most liberally distributed the excellent collections he had made in those regions. His zeal for the science was great, and he had made considerable sacrifices to increase his general herbarium, and both before and after the transferring it to the University he devoted himself to the arrangement and naming the specimens. In this operation, whatever he could not make agree with the diagnoses given in the works at his command, was set down as new, and he commenced a series of papers in the *Bulletin* to give them names and diagnoses. Unfortunately, whether from a want of a sufficient knowledge of exotic plants, from a deficiency of materials for comparison, or from the fragmentary state of many of his specimens, he did not recognize many of the commonest tropical species, and his papers are full of erroneous identifications, bad species, mistaken affinities, and even gross blunders, which can now only be corrected where we possess corresponding specimens agreeing with his descriptions. He was, however, I am told, as

amiable in disposition as he was zealous; and in his later papers, where his errors have been pointed out to him, he candidly admits them, in some cases plausibly accounting for them, and in one instance even suggesting that he must have examined a loose flower that did not belong to the specimen he described. Some other naturalists might be named who have been equally hasty, but who, on discovering their errors, have taken care that no evidence should remain to solve the enigmas they have bequeathed to science.

The languages used in the Moscow Mémoires and Bulletin are generally French or German, with Latin technical characters. The few papers in Russian are, with a few unimportant exceptions, on strictly local subjects.

Next in order we have another Slavonic language, the use of which in a journal of Natural History cannot be excused even on those pleas which might be urged in favour of the Russian. The Bohemian is at best the language of a very limited region, and there are but few of the educated classes in PRAGUE who are not, for other reasons, obliged to be acquainted with German; and yet from that town we received seven annual volumes in large octavo (1853 to 1859) of the *Ziva*, a journal of Natural History, Physics, and Mathematics, edited by Dr. Purkinje and written entirely in Bohemian. It is probably still continued, but, being useless to our Fellows, we declined taking it in exchange for our own publications; and yet there appear to be in it besides local subjects some anatomical and physiological papers, both in Zoology and Botany, which might be of interest—in vegetable anatomy and physiology by Ladislav Celakovski and Julia Saxa, in osteology by Purkinje himself, on Bohemian fish by Anton Fricke, &c. There are a few plates and a considerable number of woodcuts; but the editor has probably discovered that he must only look for a popular sale at home, as in the later numbers he introduces an appendix for domestic medicine and economy.

IV. HUNGARY.

Hungarian Academies of Science have also offered us their Transactions in exchange for ours, which we have, for the same reason, declined. I am aware that in the quarto Transactions of the Magyar Tudományok Akadémie some interesting south-east European animals and plants, including the interesting Gesneriaceous genus *Rhodopea*, have been first published; and we learn from a review in the Bulletin of the Academy of St. Petersburg,

(vol. v. 1861, p. 184), that the Transylvanian Transactions contain some good papers, especially one by Lazar on Transylvanian birds, but my own total inability to make out the language must be my excuse for entering into no further details as to the Transactions we possess in pure Hungarian. There is, however, a work entitled *Verhandlungen und Mittheilungen des Siebenbürgischen Vereins für Naturwissenschaften zu HERMANNSTADT*, in monthly numbers, 8vo, forming annual volumes, in German. I have only seen the eleventh volume for 1860, which, with a good deal of Geology, includes a series of papers by E. A. Bielz on Transylvanian Mollusca. Some Presburg publications will be mentioned presently amongst German ones.

V. ITALY.

Very few of the Scientific Academies of Italy have in modern days contributed extensively to general Zoology or Botany, the most important in this respect being that of TURIN. After having completed a first series of Memoirs in forty volumes, quarto, a new one was commenced in 1839, entitled *Memorie della Reale Accademia delle Scienze di Torino*, in two classes—the Physical and Mathematical Sciences, including Natural History, being separated from Moral, Historical, and Philological Sciences. Twenty volumes of the former have appeared up to 1863, the last received, the papers being in Italian, French, or Latin, and fairly illustrated by plates. The greater proportion of them relate to the fauna and flora of the late kingdom of Sardinia: Insects by Gené and Ghiliani; Mollusca, Crustacea, and the lower order of animals by Verani, Porro, Filippi, Strobel, Cornalia, and Pancari; Reptiles by Gené and De Natale; Mediterranean Fish by Filippi and Verani; Cryptogamous Plants by De Notaris, Meneghini, and Baglietto; and in Phænogamous Plants, Moris and de Notaris on the Flora of the island of Capraria, and de Notaris and Gennaris on the Ligurian flora. The fossil fauna of the country is illustrated by long papers of Bellardi, Michelotti and Sismonda, and the fossil flora by Visiani. On exotic and general subjects these volumes contain C. Bonaparte's Monograph of European Amphibia, Solier's Monograph of the tribe Molurides of Coleoptera, Traqui on Cypriote and Syrian Anthicini, Bellardi on Mexican Diptera, Zanardini's Adriatic Algæ, Vittadini's Monograph of Lycoperdineæ, De Notaris's American Jungermannieæ and Columbian Mosses, Figari and De Notaris's Red Sea Algology and Egyptian Agrostography, Clementi's Grecian and Eastern plants, a few miscellaneous exotic plants, chiefly Brazilian or from the Turin Gardens, described and figured

by Colla, Visiani, and Delponte, and miscellaneous papers on Animal and Vegetable Physiology by Bellingeri, Studiati, Savi, and Targioni-Tozzetti.

The Academy of Sciences of BOLOGNA commenced their quarto *Commentarii* in 1731, the old series in nine volumes closing in 1783. The *Novi Commentarii* form ten volumes to 1850, in which the principal Natural-History papers are the Botanical ones by the two Bertolonis, father and son, and those by Ranzoni on fish and reptiles. In 1850 the title was adopted of *Memorie della Accademia delle Scienze dell' Istituto di Bologna*, of which we have twelve volumes to 1861, and two volumes dated 1862 and 1863 of a second series. These are heavy volumes, of a large quarto size, well printed; but the illustrations, chiefly lithographic, are not so satisfactory as the Turinese. The scientific subjects treated of are very various. Natural History rarely extends beyond one or two each in Zoology and Botany in each volume: descriptions by Alessandri or Calori of skeletons or other animal preparations in the Museum of Bologna, obtained chiefly by exchange from Amsterdam; a series of papers, zoological by Bianconi, botanical and zoological by the younger Bertoloni, on the natural productions of Mossambique transmitted to Bologna by Fornasini, an Italian residing there; one by Centro on a fly affecting wheat; by Bianconi on the development of tendrils in *Cucurbitaceæ*, and in each volume a number of the elder Bertoloni's *Miscellanea Botanica*, which we might almost characterize as an infliction on science analogous to that of Turczaninow above alluded to. Notwithstanding the numerous valuable physiological experiments and observations for which we are indebted to Italian investigators of the past century, they appear, with few exceptions, to have cared little in the present era for making or preserving any collections not immediately connected with the productions of their own country, or for otherwise extending their knowledge of exotic animals and plants. The consequence is, that when zealous naturalists like the two Bertolonis have received sets of specimens from distant lands, everything is new to them, and, they are but too apt to conclude, new also to science at large. I know not how it may be with the Mossambique animals; but it will be found but a very low estimate if we say that above half the plants here described as new from Texas, East India, Mossambique, and Guatemala are well-known species; and a fair proportion are placed in wrong genera, or even in natural orders with which they are quite unconnected.

The Rendiconto delle Sessioni of the Bolognese Academy, a thin octavo each year from 1839 to 1864, are Reports of Proceedings of the character now demanded from most scientific bodies, with abstracts of papers read, and occasionally a short unimportant one given entire.

The Transactions of the Institute of Lombardy at MILAN, in two series, the first in five quarto volumes, from 1812 to 1838, entitled *Memorie dell' I. R. Istituto del Regno Lombardo-Veneto*, the second in nine volumes, from 1847 to 1856, as *Giornale dell' I. R. Istituto Lombardo di Scienze, Lettere et Arti e Biblioteca Italiana*, contain nothing worth special mention either in Zoology or Botany. In 1859 a Society was established especially for Natural History, at first as a Geological Society, that being the branch which its promoters specially followed; but in the following year the name was changed to that of *Società Italiana di Scienze Naturali*, and from that time they have published an annual volume in octavo of *Atti*. At first the papers were entirely geological; to these were gradually added a few on Italian insects, mollusca, and other lower orders of animals, Cantani on the secondary membrane of the vegetable cellule, numerous communications on the silkworm disease which has committed such ravages in that country, two papers transmitted by Giglioli from England, on *Apteryx*, and on the geographical distribution of birds, the latter founded in a great measure on Dr. Selater's communications to our Journal; and the last few Numbers of the *Atti* for 1864 contain Caruel's *Florula de Montecristo*, and descriptions of a few Italian plants, and a commencement of Calvadori's Enumeration of Sardinian birds.

The *Società Italiana delle Scienze*, originally founded at VERONA by A. M. Lorgna, and afterwards transferred to MODENA, commenced their quarto Transactions in 1782, each volume in two separate parts, *Matematica* and *Fisica*, at first with a continuous paging through the two; but in the later volumes, the parts having increased in bulk sufficiently to be separately bound, there is a separate paging for each. The first series was closed with the twenty-fifth volume, and contains scarcely as much Natural History as even the Bologna *Memorie*. In the later volumes I only find a Palæontological paper, and a few short botanical descriptive ones by Savi, Tenore, and Bertoloni, the plates not exhibiting any very high stage of art. In 1862 a first volume was published of a second series, containing in our sciences only a paper on some fossil plants of Italy by Massalongo, and descriptions of some supposed new Brazilian plants by Brignoli, including a re-

vised limitation of the genus *Cinchona*, reducing to it *Exostemma*, *Buena*, and several others, evidently founded on such compilations as Walpers and Dietrich, without having examined specimens of one tithe of the species so arbitrarily transposed, and totally ignorant even of Weddell's monograph of 1849.

The Proceedings of the Society are prefixed to each volume of the Memoirs. The later volumes contain an amusing discussion between the President Marianini and the Minister Matteucci (one of the forty members) with regard to a remodelling of the Academy, proposed by himself and some other members, and resisted by the majority, including the President, who at last is told that he had better resign than continue to be an obstacle to the Society's progress.

The Royal Society receives also a Zoological Journal published at Modena, and edited at first by Canestrini and others, and now by Canestrini alone, entitled *Archivio per la Zoologia, l'Anatomia e la Fisiologia*. It appears in half volumes, at first at intervals of half a year, now of above a year, there being as yet only two volumes and a half from 1861 to 1864. The papers it contains are chiefly entomological and ichthyological.

In VENICE, the Imperiale Reale Istituto Veneto di Scienze, Lettere ed Arti commenced their Atti in 1840, in large quarto. Of the first portion, previous to the disturbances of 1848, there are two thin volumes, including, with a variety of other subjects, a very few botanical papers of no great importance, by Visiani, Zanardini and others, and some zoological ones on the lower orders of animals, or anatomical, by Contarini, Nardo, Meneghini, &c. After 1848 the Atti was renewed with greater activity; and up to the end of 1862 we have ten volumes in very large quarto with many plates often on an unnecessary and inconveniently large scale, and eight thick octavo volumes with the proceedings and shorter papers. From the digest of these volumes given by the President Bellaviti, vol. ix. p. 30 of the Atti, we find that they contain fourteen papers more or less botanical by Visiani, Massalongo, and Zanardini, including Visiani's enumeration of the plants of the Venetian territory, and seventeen zoological, either physiological or relating to the lower orders of animals, all in the Italian language. The most recent parts comprise: Diptera distributed according to a new method by Livry; Betta on Venetian Mollusca, Serpents, and Amphibia; Saccard on the Flora of Treviso; Zanardini on Adriatic Algæ; and papers on fossil plants, by Visiani, Barone, and Zigno.

At NAPLES, from 1819 to 1851, the Royal Academy of Sciences published six quarto volumes of Transactions as *Atti della Reale Accademia delle Scienze* (or sometimes della *Società Reale Borbonica, Accademia delle Scienze*), with nothing worth mentioning in Natural History. In 1852 a second series was commenced as *Memorie della Reale Accademia delle Scienze*, divided into Mathematical, Natural, and Moral Sciences. In the two volumes of this set I find in our sciences only Costa's papers on a few Italian Crustacea and insects, and on the Italian fossil fish and Foraminifera. In 1862 the Academy was reconstituted as *Società Reale di Napoli, Accademia delle Scienze Fisiche e Matematiche*; and their volume of *Atti* for 1863 comprises various papers by Gasparini on Vegetable Physiology, and one by Costa on Calabrian Entomology. Each paper forms a separate Number, with a separate paging, but without any indication of a separate sale.

The *Accademia Gioenia di Scienze Naturali* of CATANIA appear to have been very active for a place of so few resources. From 1825 to 1837, they published twelve thin quarto volumes of *Atti*, and a second series, to 1864, extends already to nineteen volumes. The paper, typography, and illustrations, at first very coarse and rude, improve in the later volumes. The Natural-History papers relate chiefly to the Agriculture, Fauna, Flora, and Geology of the immediate vicinity of Mount Etna.

Other Academies with their Transactions appear to have started at different times in various Italian towns, but to have had only an ephemeral and unimportant existence, and botanical journals have been occasionally attempted. In 1803-4 Viviani published at GENOA 2 parts, octavo, of *Annales Botanici*, with descriptions of Italian plants, and extracts from foreign botanical works; and again, in 1845, Professor Parlatore, at FLORENCE, commenced a *Giornale Botanico Italiano*, devoted also chiefly to the Italian flora, or to reviews of books. The first Numbers came out in rapid succession, but it soon lingered on only at irregular intervals, and, I believe, came to a final close with the end of the second volume in 1847.

The Italian Transactions generally are in the language of the country, with a few papers in French, and occasionally in Latin, which is also frequently used for technical characters.

VI. SPAIN.

In 1847, the old Academy of Natural Sciences of MADRID, which in its time had done some good work, was reorganized as

Academia Real de Ciencias exactas físicas y naturales, and thenceforth the *Memorias de la Real Academia de Ciencias de Madrid* were published in three divisions, called series. Of the third, or *Ciencias Naturales*, we have five quarto volumes from 1850 to 1861, comprising a good deal of Geology, papers by Vidal on the birds of Albufera, by Guirao on those of Murcia, and De los Rios Naceyro on those of Galicia, Machado's *Erpetologia hispalensis*, Graells on the larvæ of *Agapantia*, and on new insects of central Spain, and Mendoza on the organs of generation in animals,—and in Botany, Graells's *Ramilletes de Plantas Españoles*, Llano's Appendix to the Philippine Flora, and Mariano del Amo on the geographical distribution of some families of plants in the Peninsula.

Towards the close of the last century Cavanilles conducted a periodical, entitled *Anales de Ciencias Naturales*, which few persons appear to have seen, and the characters of new genera and species there described have been carelessly and sometimes incorrectly abstracted by Sprengel and others. The only copy I know of in this country is in the British Museum.

In the South American States formerly Spanish colonies, there have been articles on Natural History in the *Mercurio CHILENE*; and at BOGOTÁ a *Boletín de la Sociedad de Naturalistas Neo-Granadinos*, in octavo, had attained a tenth part in 1860; but I have not seen either work.

VII. PORTUGAL.

We have on our shelves the *Historia e Memorias da Academia Real das Sciencias de LISBOA*, in three series, full-sized quarto,—the first in twelve volumes, from 1797 to 1839; the second in five, from 1843 to 1856; the third in three volumes, down to 1863. Although they have professedly a class of Natural Sciences, I can find in the whole twenty volumes nothing in Zoology or Botany, except an account of two or three Portuguese fish, and some French speculations on Organogeny.

In Brazil, a Vellozian Society of Natural History, established in 1850 at RIO JANEIRO, commenced some quarto Transactions, with rather rude lithographic plates, under the double title of *Trabalhos da Sociedade Velloziana*, and of *Bibliotheca Guanabarensis*—divided into two sections for Zoology and Botany, but the papers following each other in one continuous paging. Some of them, especially on Brazilian timber-trees, by Allemañ, are interesting, but the work appears to have come to an end the following year, 1851, forming altogether one very thin part.

VIII. DUTCH NETHERLANDS.

The Hollandsch Instituut, at AMSTERDAM, which after the pacification of 1814 became the Koninklijk Nederlandsch Instituut van Wetenschappen, Letterkunde en Schoone Kunsten, is divided into four classes, after the model of the French Institute, the first class being also sometimes called Koninklijke Akademie van Wetenschappen. The first series of its quarto Transactions, entitled *Verhandelingen der Erste Klasse van het Koninklijk Nederlandsch Instituut*, was in seven volumes, from 1812 to 1825, and contained no Natural History. The second series, or *Nieuwe Verhandelingen der Erste Klasse, &c.*, in thirteen volumes, from 1827 to 1848, and the third, or *Verhandelingen &c., derde Reeks*, in five thin volumes, 1849 to 1852, has a few scattered papers by Vrolik, Sandifort, Numann, and Schroeder van der Kolk on questions of animal physiology and comparative anatomy, monstrosities, &c., by Fremery and Reinwardt on fossil animals, and isolated notices on a stranded whale by Schlegel, and on the Potto by Van der Hoeven. In Botany we have Miquel's Revision of *Casuarinæ*, African figs, American *Cycadææ*, and *Analecta Botanices Indica*, Van Halle on a new *Polypodium*, and a whole volume in German, occupied by Schacht on the development of the embryo. In 1854 the present series was commenced under the altered title of *Verhandelingen der Koninklijke Akademie van Wetenschappen*, with a separate paging for each article, it having hitherto been continuous through each volume. Of this series we have nine volumes down to 1862. It contains, like the former series, several papers on Animal Physiology, Comparative Anatomy, and Palæontology by Vrolik, Schroeder van der Kolk, Van der Hoeven, and Bosquet, one by Harting on two Cephalopods, and Bleeker's Ichthyological Fauna of Japan. In Botany, besides observations on the Anatomy of *Sphagnum*, by Dozy, and of aerial roots of *Orchidææ* by Oudemans, we have only Van der Sande Lacoste's Javan *Hepaticææ*, and Van den Bosch's Javan *Hymenophyllææ*.

The Academy commenced a separate publication of their Proceedings, in large octavo, with short papers and a few plates, in 1841, forming six volumes to 1846, under the title of *Het Instituut*, or, *Verslagen en Mededeelingen uitgegeven door de vier Klassen van het Koninklijk Nederlandsch Instituut van Wetenschappen, Letterkunde en Schoone Kunsten*, in three volumes. Amidst a great variety of matter, scientific and literary, there are short communications in palæontology by Fremery and Van der Hoeven,

by Temminck on the Japan fauna, by Vrolik on the Carnivora, and by Miquel, Spletgerber, and De Vriese in Systematic Botany. Since 1846 the Proceedings have been separately published in an annual volume entitled *Jaarboek van de Koninklijke Akademie van Wetenschappen* gevestigd te Amsterdam; and an octavo Journal was commenced under the title of *Tijdschrift voor de Wis- en Natuurkundige Wetenschappen* uitgegeven door de Eerste Klasse van het Koninklijk Nederlandsch Instituut van Wetenschappen, Letterkunde en Schoone Kunsten: five volumes, with a few indifferent plates, were issued, dated from 1848 to 1852, containing very little Natural History, a few entomological papers by D'Ailly, Verhuell, and Numann; physiological and palæontological by Vrolik; botanical, chiefly relating to Surinam plants, by Miquel, Focke, and Van Halle; De Vriese on a new Javan *Lactæa*; Montagne on Surinamese, and Miquel on other exotic fungi. In 1853 the *Tijdschrift* was followed by *Verslagen en Mededelingen der Koninklijke Akademie van Wetenschappen, Afdeeling Natuurkunde*, but including Mathematics and Physics. In the sixteen volumes, 8vo, issued up to 1864, there is rather more Natural History than in the previous series, consisting of several papers on Animal Physiology, Anatomy, and Palæontology, by Vrolik, Van der Hoeven, Schroeder van der Kolk, Jæger, Schlegel, Mulder, many of Bleeker's on the Ichthyology of the Archipelago, of Australia, South Africa, South America, &c.; Van Hasselt on some Snakes; Snellen van Vollenhoven on Indian Lepidoptera; Harting on a bird's nest; on various points of vegetable physiology and anatomy by Oudemans, De Vriese, and Van Halle; on some Indian Orchids by Blume; on Ficæ, Australian Cycadææ, *Rhodoleia*, and new Apocynææ by Miquel; on Javan Hepaticæ by Van Sande La Coste; on Javan Oaks by Oudemans; and Hymenophyllææ by Van den Bosch.

These publications of the Dutch Academy are for the most part in the Dutch language, with a few papers in French or German, and more or less use of Latin for technical characters. The mixture of subjects is often very great, and particularly inconvenient in the compact octavo publications where the advantages of the small form and close type are quite overbalanced by the large proportion of matter useless to himself which each subscriber would be obliged to take in, thus excluding these works from all but large libraries. One instance I may mention, as having recently occurred to myself. Miquel had in the *Linnæa* published a detailed description of a new Surinamese plant re-

ferred to Leguminosæ—with characters different, it is true, from those of the Order as far as known to me, but which, on an authority like his, I admitted without hesitation; but now I have accidentally come across, not in the *Linnaea*, where the plant had been published, but in the above *Tijdschrift*, amidst agriculture, algebra, and physics, a short paper, in Dutch, on the relations of Polygalæ to Leguminosæ, by which it incidentally appears that *Rodschiedia* is a species of *Securidaca*. This correction, although made nearly fifteen years since, has been so concealed as not to come in the way of any compiler, and has now turned up too late for adoption in the *Genera Plantarum* I am engaged in with Dr. Hooker.

Several Journals of Natural History have been successively started at LEYDEN by private individuals, but all have come to an end after a few years' existence. The *Bijdragen tot de Natuurkundigen Wetenschappen verzameld door Van Halle, Vrolik en Mulders*, in seven volumes 8vo, from 1826 to 1832, included all branches of Natural History and Physics, the zoological and botanical papers not being numerous, and relating chiefly to the lower animals and plants of the country. This was followed in 1834 by Van der Hoeven and De Vriese's *Tijdschrift voor Natuurlijke Geschiedenes en Physiologie*, 8vo, with a few plates, each volume divided into two parts, with separate pagings,—1st, *Oorspronkelijke Stukken* (original papers); 2nd, *Boekbeschouwing en Letterkundige Berigten* (Reviews and Literary Notices). It was carried on through twelve volumes to 1845, and includes geology and kindred sciences. In Zoology there are contributions by Temminck, S. Muller, Van der Hoeven, Vrolik, Snellen van Vollenhoven, Schroeder van der Kolk, and a few others; and in Botany the chief papers relate to the floras of Surinam and of the Indian Archipelago.

In 1848 the *Nederlandsch Kruidkundig Archief*, in octavo parts, with one plate in each, and exclusively devoted to botany, was commenced under the editorship of De Vriese, Dozy, and Molkenboer. It came out very irregularly in the following years, and appears to have ceased with the end of the fourth volume in 1848. It contains several papers on the plants of Surinam and of the Eastern Archipelago, but is chiefly devoted to the Botany of the Netherlands.

A botanical and horticultural periodical, with plates, some coloured, chiefly with a view to publishing the novelties introduced from the Dutch Colonies, was commenced in 1858 by Siebold and

De Vriese, in large octavo, under the title of *Annales d'Horticulture et de Botanique, ou Flore des Jardins du Royaume des Pays-Bas*. It was carried on through five volumes to 1861, and then, I believe, ceased altogether.

Of a *Jaarboek der Koninglijk-Nederlandsche Maatschappij tot Aanmoeding van den Tuinbouw* (Annuary of the Royal Netherland Society for the Encouragement of Horticulture) we have received one part in large octavo, dated Rotterdam, 1864—containing a description and large coloured figure of a new genus of *Apocynæ*, and some other botanical papers. Whether the work is to continue or not, or how much of botany it is to contain, I do not know.

The *Annales Musei Botanici Lugduno-Batavi*, a collection of papers on Botany, publishing in Numbers in folio, with occasional plates, under the superintendence of Miquel, appears at very irregular intervals. There are now ten parts out, forming one volume and a portion of a second, dated from 1863 to 1865. It relates chiefly to the Botany of the Dutch foreign possessions.

A Zoological Society established at Amsterdam, under the singular title of *Natura Artis Magistra*, commenced in 1848 publishing large quarto Transactions, got up with considerable luxury of typography and illustration, entitled *Bijdragen tot de Dierkunde uitgegeven door het Koninglijk Zoologisch Genootschap Natura Artis Magistra*, and consisting of papers chiefly on the higher orders of animals. These Transactions do not appear to have gone beyond a single volume, dated from 1848 to 1854; but ten years later the same Society undertook a large octavo periodical, with a few plates, entitled *Nederlandsch Tijdschrift voor de Dierkunde*, under the editorship of Bleeker, Schlegel, and Westerman. Of this I have only seen a first volume, dated 1863, and divided into contributions from correspondents (or original papers), zoological proceedings of the Academy of Sciences, and reports from the Zoological Garden.

An Entomological Society, dating successively from the Hague and Leyden, and now from Haarlem, has published seven thin octavo volumes from 1858 to 1864, with coloured plates, of a Journal entitled *Tijdschrift voor Entomologie*, uitgegeven door de Nederlandsche Entomologische Vereeniging, and devoted exclusively to Entomology.

All the above Journals, with the exception of the *Flore des Jardins*, are in the Dutch language, with more or less of Latin for the technical characters.

The Dutch Colonies in the Indian Archipelago were amongst the first to apply themselves to the cultivation of science and literature. The Society of Arts and Sciences of *BATAVIA* commenced their Transactions in 1779, under the title of *Verhandelingen van het Bataviaasch Genootschap van Kunsten en Wetenschappen*. The first volumes are in octavo, with, as might be expected, coarse paper and typography; but they soon extended to small quarto, and in 1849 to full-sized quarto, with much improvement in the execution. There are now twenty-nine volumes up to 1862; they contain, however, no Natural History of any importance, with the exception of Bleeker's Ichthyological papers in some of the later volumes. These Transactions are chiefly in Dutch, with some memoirs (it is to be supposed, on literary or historical subjects) entirely in Oriental language and character. Since 1853 the same Society has also published an annual volume of a Journal or *Tijdschrift* of their proceedings, including a few short papers, chiefly historical, literary, or ethnographical.

Another scientific Society in Batavia has published, up to 1859, six quarto volumes of Transactions under the double title of *Acta Societatis Scientiarum Indo-Neerlandicæ*, and *Verhandelingen der Natuurkundige Vereeniging in Nederlandsch Indië*. Amidst various other sciences, these volumes contain a considerable number of Bleeker's Ichthyological and Carcinological papers, occupying the greater portion of nine volumes, besides Bernstein on Javan birds and birds' nests, Rosenberg on Sumatran birds, Doleschall on Arachnidæ of the Archipelago, Hasskarl on Javan ferns and on some plants of the Buitenzorg garden, and Zollinger on *Rottlera*. The papers are mostly in Dutch, but usually with Latin technical characters; and every paper, however short, and although several on the same subject sometimes follow each other, has its separate paging.

IX. BELGIUM.

The *Société Littéraire de BRUXELLES*, established in 1769, through the exertions of Count de Cobenzl, Imperial Minister Plenipotentiary to the Low Countries, was transformed in 1772 by the Empress Maria Theresa into the *Académie Impériale et Royale des Sciences et Belles-Lettres de Bruxelles*. Broken up on the second invasion of the French armies in 1794, it was re-established in 1816, dropping the word *Impériale* from its title. The old series of its quarto Transactions consists of five volumes, from 1777 to 1788, entitled *Mémoires de l'Académie Impériale et*

Royale des Sciences et Belles-Lettres de Bruxelles, containing little if anything now worth referring to in Natural History. In 1818 a new series was commenced as *Nouveaux Mémoires de l'Académie Royale des Sciences et Belles-Lettres de Bruxelles*, which, with the twentieth volume, in 1847 was altered to *Mémoires de l'Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique*, but without recommencing the series of volumes, of which the last received is the thirty-fourth, dated 1864.

In all these volumes, the papers on the very different subjects coming within the scope of the Academy, scientific, literary, or artistical, are mixed; but, with a view to rendering them separable, each paper has a separate paging. Natural-History papers do not occupy a very large portion of the space, and among them many are palæontological, and a few on the local flora and insect fauna, a considerable number by Van Beneden on Malacology and Zootomy, some also by Udekem on Infusoria, by Cantraine on Mediterranean Malacology and Ichthyology, by Poelman on the Anatomy of the Tapir, on questions of Vegetable Physiology and Carpography by Dumortier, on Vegetable Physiology and a few garden plants by Morren, which, with Courtois's European Limes, Decaisne's Anatomy of Mistletoe, Martens and Galleotti's Mexican Ferns, and Spring's Lycopodiaceæ, make up the botanical portion.

During the same period the Academy published a separate quarto series, with plates, of memoirs whose authors were not yet Academicians. Of these we have thirty-one volumes, ranging from 1818 to 1863, commenced under the title of *Mémoires couronnés par l'Académie Royale des Sciences et Belles-Lettres de Bruxelles*, which, with the sixteenth volume (1843), was changed to *Mémoires couronnés et Mémoires des Savans Étrangers, publiés par l'Académie Royale des Sciences et Belles-Lettres de Bruxelles*, and again, with the nineteenth volume (1847), further altered by the substitution of *Académie Royale des Sciences, Lettres et Beaux-Arts de Belgique* for the former name of the Academy. These *Mémoires couronnés*, like the other series, have no great proportion of Natural-History papers, and those chiefly Geological or Palæontological. The principal ones in Zoology and Botany proper are Lambotte on the Anatomy of Batrachians, Verlooren on Circulation in Insects, Udekem on an Earthworm, Poelman's Anatomy of *Python*, Schuermans on a Lemur, Decaisne on Madder, and Coemans on *Pilobolus* (Fungi).

The Belgian Academy prides itself in being one of the first to set the example of giving their Minutes of Proceedings (with abs-

tracts of the papers read) in a more convenient octavo form, which could be issued at much shorter intervals than the quarto Transactions. But as they also include at first short communications only, but subsequently longer papers also *in extenso*, and as each branch of science or literature is encumbered with all the others, the advantages of the compact form are lost. Under the title of *Bulletin de l'Académie, &c.*, twenty-three volumes of the first series, from 1832 to 1856, with one of index, and seventeen of the second, from 1857 to 1864, had so grown in thickness that, from the sixth of the first series (1839), each one is divided into two parts, with separate paging, so as practically to make two volumes each year. The zoologist has thus to seek in a mass of above seventy volumes for a few papers by Wismael, Beneden, De Sélys-Longchamps, Udekem, and others; and although the botanist may find Martens and Galeotti's enumeration of Mexican plants occupying a considerable portion of the volumes for a single year (1847, tenth of the first series), there are several smaller contributions, independently of those relating to Belgian botany, that are so scattered and lost in the mass of heterogeneous matter, that they are almost universally overlooked.

The Société Royale des Sciences de LIÈGE, established in 1835, was divided into two sections—Sciences d'Observation, and Sciences de Calcul; but the papers read in the two sections were mixed in their published Transactions, entitled *Mémoires de la Société Royale des Sciences de Liège*. Eighteen volumes, large 8vo, with plates, are dated from 1844 to 1863. More than one-third of them are devoted to Entomology, by Lacordaire, De Sélys-Longchamps, Chapuis, Candèze, and others, some papers filling one, two, or even three volumes. There are also a paper by Beneden on the Ears of Birds of Prey, by Malherbe on a Brazilian *Picus*, by Drouet on French Mollusca, and one botanical one—Decaisne on *Diplosiphon*.

The Bulletins de la Société Royale de Botanique de Belgique at BRUSSELS form a thin octavo volume of two or three parts in each year, with an occasional plate. Three volumes have been received, from 1862 to 1864, hitherto confined to either local or cryptogamic Botany.

Société de Sciences Naturelles, Grand-duché de Luxembourg, afterwards Société des Sciences Naturelles du Grand-duché de Luxembourg, is the sole title of the Transactions published by the Society at LUXEMBOURG in octavo. There are seven parts, or years dated from 1853 to 1864, containing, amongst a great variety of

subjects, some papers on the local fauna and flora, especially insects and cryptogams.

There are several Belgian horticultural journals and periodicals with more or less of Botany; and two of them especially, under the direction of the two great rival nurserymen of GHEENT, contain numerous original descriptions and figures of new plants, with occasional botanical notices and short monographs. The *Flore des Serres et des Jardins de l'Europe*, by Van Houtte, with the occasional assistance of Planchon, Decaisne, and other eminent French botanists, was commenced in 1845, and, with some interruption a few years since, still continues its monthly issue in octavo, with plates mostly coloured in imitation of (and in the early volumes often copied from) our Botanical Magazine and similar publications. It is now in its fifteenth volume, the last five sometimes considered as a second series. The rival publication, edited by Charles Lemaire, and entitled *Le Jardinier Fleuriste, Journal général des progrès et des intérêts Botaniques et Horticoles*, was originally commenced in 1851 in large octavo, with coloured plates the majority copied from English periodicals, and continued through four volumes to 1854. It was then recommenced by the same editor, but, it would appear, more immediately under the direction of Verschaffelt, with the new title of *Illustration Horticole, Journal spécial des Serres et des Jardins*, with more original plates and matter. It appears monthly, and is now in its twelfth annual volume.

X. GERMANY.

1. *Transactions and Journals of Scientific Associations.*

The peripatetic Academy *Naturæ Curiosorum*, which changes its locality according to the residence of its president, considered itself, under the *ancien régime*, as the Physico-Medical Academy of the German Empire, and was then established at NUREMBERG, but with the understanding that it might move to any Imperial city. It was supported by the Imperial Government, and published under the long title of *Acta Physico-Medica Academiæ Cæsareæ Leopoldino-Carolinæ Naturæ Curiosorum*, a first series of ten small quarto volumes, from 1730 to 1754, and, as *Nova Acta*, a second series of eight volumes, from 1757 to 1791, of Transactions, with little if anything of Natural History that need now be referred to. After the publication of the eighth volume, a long interruption ensued. The successive deaths of two presidents in the course of a twelvemonth, and the horrors of the French inva-

sion and wars, resulted in the breaking up of the meetings of the Academy, the seizure of their funds, and the destruction of the greater part of their property. It was not till after a lapse of more than twenty years that the Society was, on the reestablishment of peace, reconstituted at ERLANGEN, under the presidency of Von Wendt; and in 1818 a new volume of the Transactions appeared in a larger quarto form, with improved typography and paper, forming the ninth volume of the *Nova Acta Physico-Medica Academiae Cæsareæ Leopoldino-Carolinæ Naturæ Curiosorum*, or the first with a German title-page of *Verhandlungen der kaiserlichen Leopoldinisch-Carolinischen Akademie der Naturforscher*. The German language was now admitted, and in most papers, with the exception of technical characters, generally replaced the Latin; and the volume, although continuously paged, is divided into four sections, Botany, Zoology, General Physics, and Medicine, the first occupying more than one-half.

After Von Wendt's death, the Academy passed under the presidency of Nees von Esenbeck, then resident at BONN, and considerable discussion and jealousies arose as to its moving from the Bavarian to the Prussian dominions, the old Empire, under which its regulations had been originally formed, having disappeared. It is said that amongst the arguments which prevailed in favour of its moveability were those of Oken, the same which suggested to him his plan for the German Association for an annual gathering, in different towns, of Naturalists and Medical Men, *Naturforscher und Aertzte*, which has been the origin of all the peripatetic associations now so successful in this and other countries*. The Academy remained many years at Bonn, then passed with its president to BRESLAU, from whence it moved to JENA under Kieser, and is now at DRESDEN under Carus. Since the removal from Erlangen, twenty-two volumes of Transactions have been published, not divided into sections, but often accompanied by supplements as large as the volumes, or by papers appended to the prefaces, with a variety of paging, creating some confusion in references, besides that the volumes themselves were for many years differently numbered in the German title, which supposed the series to commence with the Erlangen volume, and in the Latin one, which included the eight old ones. With the twenty-fifth, however, this discordant numbering ceased, the German title skipping from the

* The merit of having originated this plan is also claimed by the *Société Helvétique des Sciences Naturelles*, but perhaps under the same influence of Oken.

sixteenth to the twenty-fifth, and the supplements were gradually discontinued. The reason for having allowed them was probably in order that the separate copies of long memoirs might retain the original paging without the appearance of incompleteness. This has now been accomplished by separately paging every article. The typographical execution and illustrations have been gradually improved, and in the last volume, the thirty-first (1864), the size has been still further enlarged. The title has been slightly shortened by the omission of the words "Physico-Medica" since the supplements to the nineteenth volume, but is still inconveniently long for references. The papers of the whole twenty-two volumes are chiefly botanical or zoological, many of them long, and well known from the separate copies distributed. They are also here and there intermixed with a few in Mineralogy, Geology, Chemistry, Astronomy, Optics, Meteorology, Ethnology, &c.

The Proceedings of the Society for a long time were included in the prefatory matter of the different volumes, then for a short time published in Seemann's *Bonplandia*, and now form separate quarto Numbers under the title of *Leopoldina*. They include a few abstracts of papers and short reviews, besides the formal proceedings.

The voluminous publications of the Royal Society of Sciences of GÖTTINGEN needed not to have been here mentioned, but that some botanical papers of Murray's and Schrader's in the older series are not unfrequently quoted, and the present series has been selected by Grisebach for some of his contributions to systematic and descriptive botany, which are always too valuable to be lost sight of. These, and a few zoological papers of Berthold's on Amphibia, Reptiles, and Crustacea, are almost the only ones connected with any branch of Biology in the whole set, on an average about one paper for every two volumes. The different series, all in 4to, many of them distinguished only by the most trifling alterations in the title, are as follows:—

1. *Commentarii Societatis Regiæ Scientiarum Gottingensis*, 4 vols. 1751 to 1754.

2. *Novi Commentarii Societatis Regiæ Scientiarum Gottin-gensis*, 8 vols. 1769 to 1777.

3. *Commentationes Societatis Regiæ Scientiarum Gottin-gensis*, 16 vols. 1778 to 1808.

4. *Commentationes Societatis Regiæ Scientiarum Gottin-gensis Recentiores*, 8 vols. 1808 to 1837.

5. *Abhandlungen der königlichen Gesellschaft der Wissen-*

schaften zu Göttingen, commenced in 1843, and the last volume received, the 11th, for 1863.

In the first four series historical, physical, and mathematical sciences are mixed; in the *Abhandlungen*, the papers are divided into three classes, with separate pagings and titles, the *Physikalische*, the *Mathematische*, and the *Historisch-philologische*.

The *Nachrichten von den königlichen Gesellschaft der Wissenschaften und der Georg-Augusts Universität zu Göttingen*, published in Numbers, forming annual volumes, foolscap 8vo, amidst short papers on all branches of science, contain a few zoological and botanical ones, as, for instance, in the volume for 1864, we find Grisebach's Review of *Venezuela Bromeliaceæ*, with descriptions of new genera and species, and Keferstein on the geographical distribution of *Prosobranchia*.

The Royal Academy of Sciences of BERLIN, established early in the eighteenth century, published at first an occasional quarto volume in Latin, under the title of *Miscellanea Berolinensia*, of which eight volumes appeared up to 1744. These were followed by French *Mémoires de l'Académie Royale des Sciences de Berlin*, in fifty-four volumes in three series: the first, of twenty-five volumes from 1745 to 1769; the second, as *Nouveaux Mémoires*, in sixteen volumes, from 1770 to 1785; and the third, as *Mémoires* again, in thirteen volumes, from 1786 to 1804. They then began the present German series, entitled *Abhandlungen der königlichen Akademie der Wissenschaften zu Berlin*. Of this there are now forty-six thick volumes, the first comprising the Transactions from 1804 to 1811, the four following ones from 1814 to 1823, since which there is a volume for the Transactions of each year, although generally the date of publication is one or two years in arrear; and there is occasionally a supplemental volume, the last received being the volume for 1863, with the publication-date for 1864. The volumes not being numbered, this double date on the title-page occasions some confusion in references. Each volume of the present German series is divided into three sections, each with a separate paging: 1. *Physikalische*; 2. *Mathematische*; 3. *Philologische and historische Abhandlungen*. There are often many plates, and those of the later volumes are very good. The zoological and botanical papers are not numerous, but some of them important: the principal ones contained in the last twenty volumes are Lichtenstein and Peters's zoological papers, chiefly on Mammifera of the Berlin Museum, or on Mosambique Mammalia and Brazilian Lizards; only one short

entomological paper, by Klug on *Synemon* ; various contributions to Palæontology by v. Buch, Müller, Beyrich, and Hensel ; several by Ehrenberg on microscopic organisms ; a series of memoirs by Müller on the structure and development of Echinodermata ; by Link, Karsten, and Hanstein, on questions of vegetable Anatomy ; A. Braun's Individuum, and Parthenogenesis and Polyembryony ; and a few systematic-botanical papers by Kunth and Klotzsch.

In 1836 the Academy commenced the reports of their proceedings in octavo, published monthly, except during the summer vacation, under the unmanageable title of Bericht über die zur Bekanntmachung geeigneten Verhandlungen der königlichen preussischen Akademie der Wissenschaften zu Berlin, each year forming a volume, at first a thin one, but gradually extended. In 1858 the general title was shortened to Monatsbericht der königlichen preussischen Akademie der Wissenschaften zu Berlin ; and an excellent index to the first twenty-three volumes was soon afterwards published. These Proceedings do not separate the Physical from the Mathematical and Philological and historical classes : they include abstracts of the papers read ; and, especially in the later volumes, there are often short papers *in extenso*, with a few plates. Fortunately those on zoological and botanical subjects, not repeated elsewhere in more detail, are very few. The most important in the recent volumes are Peters's descriptions of animals from the Museum of Berlin, Hæckel on the Mediterranean Radiolaria, Ehrenberg on Northern Deep-Sea Microzoological Productions, De Bary on *Ceoma*, A. Braun on South American Characeæ, and some notes on *Isoëtes* and *Marsilea*, and Klotzsch's review of Aristolochiaceæ.

The Gesellschaft naturforschender Freunde zu Berlin was established in 1773, and published sixteen volumes of Schriften in octavo, from 1775 to 1794, with little, if anything, now deserving of notice. In 1795 they made great efforts to reorganize and improve their publications, and a new series appeared, entitled Der Gesellschaft naturforschender Freunde zu Berlin neue Schriften, 4to, with plates. Of this there are four volumes, from 1795 to 1803, containing, besides Mineralogy, Geology, Physics, and local Natural History, a few short zoological papers and several in botany, by Willdenow, Swartz, Link, and others. After another interruption, it was resumed in 1807 as a quarterly publication, four parts 4to, forming a thin annual volume with indifferent plates, under the title of Der Gesellschaft natur-

forschender Freunde zu Berlin Magazin für die neuesten Entdeckungen in der gesammten Naturkunde. This series includes also Geology, Mineralogy, Chemistry, Physics, and Mathematics ; but there are a considerable number of zoological papers by Lichtenstein, Klug, and others, and a few in Botany, at first by Willdenow and Swartz, afterwards by Nees, Treviranus, Link, Sprengel, and Lehmann. The parts soon got into arrear, and came to an end with the eighth volume for 1814 published in 1818. Several years afterwards a further attempt was made ; but I only know of one volume, dated 1829, under the name of *Verhandlungen der Gesellschaft naturforschender Freunde zu Berlin*.

A Botanical Society at Berlin publishes a volume of *Journal* of about twenty sheets in each year, 8vo, which I have not seen.

The *Berliner entomologische Zeitschrift* herausgegeben von dem entomologischen Vereine in Berlin, is an annual octavo volume, usually in quarterly parts, with a few plates ; it extends to four volumes, from 1857 to 1860, exclusively devoted to Entomology.

VIENNA, notwithstanding the eminent men it has produced, and the richness of some of its collections, is not to be reckoned amongst the old academic centres of Germany. In 1835 and 1836 the presence of a number of active young naturalists, more or less connected with the Imperial Museum of Natural History in the Burg palace, induced the directors to set on foot a publication in imitation of the *Annales* and *Mémoires* of the French Museum. It was published in quarto parts, with plates ; and two volumes were nearly completed in the three years from 1835 to 1837, under the title of *Annalen des Wiener Museums der Naturgeschichte*. The last part, completing the second volume, appeared many years later, after which the work wholly stopped. These volumes were limited to Zoology and Botany, comprising descriptions of Brazilian Fish and Reptiles by Natterer, and papers in Ornithology by Fitzinger and Heckel, in Ichthyology by Heckel, in Entomology by Kollar and C. Marshall, in Helminthology by Diesing, and in descriptive Botany by Endlicher, Fenzl, and myself.

At length (in 1847) an Imperial Academy of Sciences was established, and divided into two classes, the Philosophic-historical and the Mathematic and Natural-Science Classes. The political disturbances, however, of the following year delayed their operations, and the first volume of their *Transactions* did not appear till 1850, since which they have been regularly issued to the present time under the title of *Denkschriften der kaiser-*

lichen Akademie der Wissenschaften, Mathematisch-naturwissenschaftliche Classe. The form first adopted was in folio, which, after the first four volumes, was reduced to large quarto, and has been preserved to the present time with great luxury of typography, and the work is illustrated by a profusion of plates, many of them beautiful in execution. The last volume received is the twenty-third, dated 1864; each one is divided into two parts, with separate pagings, entitled *Abhandlungen von Mitgliedern der Akademie*, and *Abhandlungen von Nichtmitgliedern*, according as the authors of the papers are members of the Academy or non-members, a most inconvenient division, as complicating references and the more so as a different division is adopted for the Proceedings. A considerable portion of these volumes is, as usual, occupied by mathematical, physical, chemical, geological, &c., papers, and in Natural History Palæontology takes a conspicuous place, including Ettingshausen's papers on fossil ferns and other impressions; and, in illustration of them, on the variation of recent leaves and ramifications of ferns, with a large number of nature-printed plates. In recent zoology and botany there are many contributions to zoological Anatomy, especially of the lower orders, by Hyrtl and Langer; to Ichthyology by Heckel, Kner, and Steindachner; to Helminthology by Diesing, with one on the same subject by Molin; an entomological paper by Kollar; Schmarda on Egyptian microscopic and other lower animals; Schwartz v. Mohrenstein's Monograph of Rissoidæ; Schmidt's Herpetology of the Cracow Museum; several contributions by Unger to vegetable Physiology and Palæontology; a few systematic botanical papers of Fenzl's in the earlier volumes; Lorenz on *Ægagropila*; Reichhardt on the Anatomy of Fern-stems; Fritz on Thermal Constants for the flowering and fructification of garden-Plants; and Berger on the popular German names of Plants, the latter honoured with more typographical display than the subject, or the manner of treating it, seems to require.

The Proceedings, in octavo, commenced with the Transactions, in two separate series for the two classes. For the Mathematical and Natural Class, under the title of *Sitzungsberichte der mathematisch-naturwissenschaftlichen Classe der kaiserlichen Akademie der Wissenschaften*, forty-two volumes appeared up to the close of 1860, with copious indexes for each of the first three ten-volumes, and for the last twelve. In 1861 they were further divided into two separate series: the first for Mineralogy, Botany, Zoology, Anatomy, Geology, and Palæontology; the second for

Mathematics, Physics, &c. Of the former, two volumes a year are made up, of two, three, or four parts each. They contain the usual reports of meetings, abstracts of papers, and short papers *in extenso* with a few plates: amongst the latter, in Natural History, Palæontology always takes a large share; there are also several on animal and vegetable anatomy and physiology, and a very few systematic, chiefly ichthyological, by Steindachner or Kner.

In 1847 also a kind of Natural-History publishing Society appears to have been formed at Vienna by W. Haidinger; or, at any rate, the friends and subscribers to his publications had occasional meetings at his house; and, under his editorship, a series of Transactions and Proceedings like those of regular Academies and Societies was commenced. Of the former, in large quarto, with plates, four volumes were published from 1847 to 1851, under the title of *Naturwissenschaftliche Abhandlungen gesammelt und durch Subscription herausgegeben von Wilhelm Haidinger*. The first volume is continuous, the second and third each in two parts, and the fourth in four parts, each with its separate paging and series of plates, thus complicating references by the necessity of quoting the part as well as the volume. The majority of the papers are physical, chemical, geological, or palæontological. In recent Zoology and Botany there is one by Rossi on Arachnides, by Hammerschmidt on Entozoa and on Mexican Butterflies, by Lobarzewski on some new Mosses, by Reissek on Endophytes of Plant-cells, and two or three on local plants and insects. During the same period of 1847 to 1851 Haidinger published seven volumes of octavo Proceedings, under the title of *Berichte über die Mittheilungen von Freunden der Naturwissenschaften in Wien, gesammelt und herausgegeben von Wilhelm Haidinger*. They contain nothing worth referring to in Zoology or Botany.

In 1851, when Haidinger's work ceased, a regular Zoological-botanical Society was established, and commenced publishing for each year an octavo volume entitled *Verhandlungen des zoologisch-botanischen Vereins in Wien*, divided into two parts: *Sitzungsberichte* or Proceedings, and *Abhandlungen* or Papers read; each with its separate paging, and accompanied by a few plates. The thirteen volumes we have up to 1863 include fossil as well as recent Zoology and Botany; the entomological papers are numerous; there are also several ichthyological by Steindachner and others, on Batrachia by Fitzinger, on Red Sea Crustacea by Heller, a few notices of the Novara Expedition, and of some birds of the

Vienna Museum; and scarcely anything in Botany, except Mas-salongo on some Brazilian Lichens, Reissek on the wild Vines of Austria, and Bolle on the Canary-Island *Scrophularias*.

In all the above Vienna publications the memoirs are generally in German, with more or less of Latin for technical characters; in a few instances only, the text is in Italian.

The Academy of Sciences of MUNICH published in the last century ten volumes of quarto Transactions, entitled *Abhandlungen der chur-baierischen Akademie der Wissenschaften*, with very little of Natural History in them. In 1807 it was reorganized as a Royal Academy in three classes, the Philologic-philosophical, Mathematico-physical, and Historical, and published nine volumes quarto, from 1808 to 1824, entitled *Denkschriften der königlichen Akademie der Wissenschaften zu München*. The papers are distributed in each volume into the three classes; in the first volume with a continuous paging, but in the subsequent ones with a separate paging for each class. The Natural-History papers in the Mathematico-physical class are not numerous, and many of those palæontological. There are also papers by Tilesius on Brazilian and Japanese Fish and Mollusca, Oppel on *Tanypus*, Schneider on *Gecko*, Spix on Apes, and on the Anatomy of Leeches, and a few of little importance in systematic Botany, by Willdenow in the first volume, and latterly, by Schranck, Martius, and Zuccarini, including the first portion of a monograph of American *Oxalides* by the latter. In 1827 the Academy was again reorganized, and it was determined that each class should in its turn make up the yearly volume, thus forming three separate series of Transactions, of each of which a volume should appear every three years. The Mathematico-physical class began; and we have now nine volumes, dated from 1832 to 1863, of the *Abhandlungen der mathematisch-physikalischen Classe der königlichen bayerischen Akademie der Wissenschaften*; the first three volumes published each at one time, the fourth in two separate parts with separate pagings. Since then, some of the volumes have also been issued at intervals in parts, and latterly separate title-pages are given for each paper, but the paging of each volume is continuous. The volumes of each series have their own numbering; but there is also a continuous numbering for the whole three, reckoned from the commencement of the *Denkschriften* in 1808. Thus the last or ninth volume of the "Abhandlungen" of the Mathematico-physical Class is also numbered thirty-fourth "in der Reihe der Denkschriften." In the nine volumes, the most numerous papers in Natural

History are A. Wagner's in Palæozoology and on Tropical-American Mammalia. There are also papers in animal Anatomy and Osteology by Erdl, R. Wagner, and H. Rathke, on Entomostraca by Seb. Fischer, and a monograph of Parrots by Wagler. In Botany the chief contributions are Zuccarini's American *Oxalides*, his enumeration of Japanese Plants, his *Plantæ novæ et minus cognitæ*, and some short morphological papers, Martius's monograph of Erythroxyloids, Ledebour on *Pugionium*, Treviranus on the Germination of *Nymphæa*, and a muscological paper of Bruch's. The papers are in German or Latin, and illustrated with well-executed plates.

The Proceedings of the Academy were for many years published in separate sheets in quarto, in two columns, upon very indifferent paper, making up semiannual volumes, under the title of *Gelehrte Anzeigen der königlichen bayerischen Akademie der Wissenschaften*, each volume at first with separate pagings for the three classes and for the *Bulletin der drei Classen*, but latterly with a continuous paging for the whole volume. The fifty volumes (very thin from 1842 to 1850) from 1832 to 1860 contain little in Natural History beyond proceedings, abstracts, and short communications of temporary interest, except an occasional short botanical paper by Martius, and very rarely any Zoology. In 1860 the *Gelehrte Anzeigen* were replaced by an octavo publication, entitled *Sitzungsberichte der königlichen bayerischen Akademie der Wissenschaften zu München*, published in parts forming half-yearly volumes, the three classes mixed; although occasionally short papers are given *in extenso*, and sometimes with plates. We have thus some diagnoses of Central-American Fish by Kner, Martius on the characters of *Cinchona*, Nägeli on the structure of Cell-membranes, and others, so buried in the mass of Physics, Mathematics, Philology, History, &c., that few will care to hunt them out.

Museum Senckenbergianum is the short name adopted for three quarto volumes, published at FRANKFORT in the years 1834, 1837, and 1845, under the full title of *Abhandlungen aus dem Gebiete der beschreibenden Naturgeschichte, von Mitgliedern der Senckenbergischen naturforschenden Gesellschaft in Frankfurt am Main*. A few of these papers are palæontological; but the greater number are descriptive in recent Zoology and Botany; the former chiefly by Rüppell, Reuss, Kittlitz, von Heyden, and Kaup, the Botanical by Fresenius, J. G. Agardh, and Schultz-Bipontinus; and almost all relate to the Arabian and Abyssinian fauna and flora

from the collections of Rüppell. In 1854 the same Society began a new series in a somewhat larger quarto, with improved plates, under the title of *Abhandlungen herausgegeben von der Senckenbergischen naturforschenden Gesellschaft*. Of this we have four volumes, and the first and second parts of the fifth for 1864. They contain many mineralogical, meteorological, and especially palæontological papers, and, in Zoology, chiefly anatomical or osteological by Luce, Bruch, Ecker, H. Müller, histological by Mettenheimer, A. Schmidt, and H. Klos, and on insect-development by Weissmann; in Botany, papers by Schacht on vegetable anatomy, Buchenau on inflorescence, various cryptogamic and histological communications by Fresenius, De Bary on Algæ and Fungi, and Mettenius on Ferns.

The Botanical Society of RATISBON, one of the oldest devoted to one special branch of Natural History, established in 1790, appears from the year 1802 to 1807 to have published six volumes of a *Botanische Zeitung*, with which I am unacquainted; nor do I believe it to be in any of our Libraries. After that, a long period of wars and political convulsions completely crippled the Society until after the general pacification of 1814, when it was reorganized, obtaining a fixed locale and income, and reverted to the plans of publication it had frequently contemplated. A first volume of quarto Transactions, with a few plates, appeared in 1815, under the title of *Denkschriften der königlich-baierischen botanischen Gesellschaft in Regensburg*, followed by a second in 1822, a third in 1841, and a fourth, in two parts with separate pagings, in 1859 and 1861 respectively. Besides local subjects, these volumes contain some illustrations of Brazilian plants by Martius and others, a few of Fenzl's papers on exotic plants, a review of the Arctic flora by Ed. Martens; and the last part is entirely taken up by the lichen flora of Bavaria, by A. Krempelhuber. A first part of the fifth volume has been since published, but not yet received in this country. The Society also resumed its botanical Journal, entitled *Flora oder Botanische Zeitung der königlich-baierischen botanischen Gesellschaft in Regensburg*, in 1818, and has continued it uninterruptedly to the present day, at first under the editorship of Hoppe, and afterwards, during a long period, under that of Fürnrohr. It appeared in Numbers, usually of a single sheet at first, in small post octavo, the first year three times a month, forming one volume, the succeeding twenty-four years, to 1842, four times a month, forming two volumes in each year, but with a continuous paging for

the year as to the regular weekly sheets; to each volume, however, was added a number of sheets of *Beilage*, *Intelligenz-Blätter*, *Litteratur-Berichte*, &c., appearing at irregular intervals, with separate pagings, so as to create some confusion in references, remedied, it is true, in part by good classified indexes to each volume; and some years later a general index to the twenty-five years was given by Hasskarl, the utility of which is not a little marred by the wonderful typographical confusion and hieroglyphics. From 1843 the periodical issue has been continued, but in a somewhat enlarged octavo form, and a greater economy of supplemental sheets, the forty-eight numbers of each year forming one annual volume up to the death of Fürnrohr in 1861. Since then it has been taken up by Herrich-Schäffer, but with a considerable reduction of the number of sheets to each year, only thirty-eight in 1862, but now increasing again to forty or more, and it is announced that the former number of forty-eight will be shortly resumed. In this long series, now consisting of above seventy volumes, there is a large proportion of botanical excursions, reviews of books, personal and other intelligence, and other matter of merely local or temporary interest; but there are also not only original communications in systematic and descriptive Botany, relating especially to the flora of Brazil, the Indian Archipelago, South Africa, &c., by Martius, Blume, Hasskarl, Zollinger, Drège, and others, but much might be gleaned from numerous records of observations in vegetable biology by residents in South Germany and Switzerland. It is announced that Cryptogamy, especially Lichenology, is henceforth to be a prominent feature. Some extra sheets have been given for the last two years, with a separate paging, entitled *Repertorium der periodischen botanischen Litteratur*, an enumeration of the titles of botanical articles in various transactions and journals, as received by the Ratisbon Society.

Having isolated Botany, the Ratisbon naturalists appear to have considered it logical to associate Mineralogy with Zoology; for they announce nine volumes, or parts, of *Abhandlungen der zoologisch-mineralogischen Vereins in Regensburg*, which I have not seen; but, judging from their octavo journal, entitled *Correspondenzblatt der zoologisch-mineralogischen Vereins in Regensburg* of which the Royal Society has nine years, from 1847 to 1855, forming about three volumes, the Zoology is almost limited to that of South Germany, the chief contents being geological.

The *Verhandlungen des botanischen Vereins für die Provinz*

Brandenburg und die angrenzenden Länder, BERLIN, in octavo, formed thin annual octavo volumes with a few indifferent plates. They have now been somewhat enlarged, and appear in four parts to the volume. The last received is the sixth volume, for 1864, but the greater portion published in the present year. The papers relate chiefly to the local flora; but some noteworthy observations in physiological Botany might be gleaned from them.

The *Verhandlungen des naturhistorischen Vereins des preussischen Rheinlandes*, to which was afterwards added (from the seventh volume, 1850) und *Westphalens*, published at BONN, sixteen volumes, octavo, from 1844 to 1859, relate to local Natural History, recent and fossil, Geology, Mineralogy, with a few more general papers in animal and vegetable Physiology, chiefly by Mayer.

The *Verhandlungen des naturforschenden Vereins in BRUNN* (Moravia), two thin octavo volumes or parts, for 1862 and 1863, include Mathematics, Physics, Geology, &c., the Zoology and Botany relating almost exclusively to the insect fauna and to the flora of the country, with a monograph, by Leonhardi, of *Characeæ* "considered from a morphogenetic point of view."

The Natural-History Society of DANZIG, founded in 1745, published, in the middle of the last century, three quarto volumes, and again another in 1778, which it is now not necessary to refer to. In 1820 was commenced a new series, entitled *Neue Schriften der naturforschenden Gesellschaft in Danzig*, of which the Royal Society has five volumes in quarto, with plates, up to 1856, but of which at least one more has been published. The papers have all separate pagings, and were published either separately or two or three at a time in parts. Some are meteorological, physical, or geological; many are zoological, especially in Comparative Anatomy and Physiology, by Rathke and C. T. von Siebold, with some by Menge on *Arachnida* and on the fauna of the lower orders of the country, with two or three short botanical ones of no importance.

Natural-History Societies appear to have been established in several of the smaller towns in Germany, under the name of *Isis*; but the only one whose publications I have seen is or was at DRESDEN, where a periodical was published in numbers of one or two sheets, forming two annual volumes, large octavo, with a few plates, for 1846 and 1847, entitled *Allgemeine deutsche naturhistorische Zeitung im Auftrage der Gesellschaft Isis in Dresden*. Besides reviews and miscellaneous notices, it contains original papers in

Physics, Geology, Palæontology, Zoology, and Botany, of very little or no importance; and the publication appears to have ceased with the troubles of 1848.

At FRANKFORT is also published, under the title of *Der zoologische Garten*, an octavo monthly journal, forming annual volumes, without plates. This was at first the organ of the Zoological Society of Frankfort, and was edited for four years by Weinland, and devoted almost exclusively to the breeding and education of animals in zoological gardens. The fifth volume, for 1864, edited by Bruch, continues nearly on the same plan, but with the addition of a variety of short communications in general and systematic Zoology.

The Natural-History Society of FREIBURG IM BREISGAU, established in 1821 and reorganized in 1846, published three thin volumes, 1849 to 1853, octavo, without plates, of *Beiträge zur rheinischen Naturgeschichte herausgegeben von der Gesellschaft für Beförderung der Naturwissenschaften zu Freiburg im Breisgau*, relating, as its title imports, exclusively to the Natural History of the country, chiefly Entomology and Botany, but including Geology and Meteorology. In 1853 they extended their sphere of action to general Natural History, and commenced the publication of *Berichte über die Verhandlungen der naturforschenden Gesellschaft zu Freiburg im Breisgau*, in octavo, but with improved typography and accompanied by a few plates. Eight parts, forming two volumes, and two parts of a third volume have appeared up to 1864. Besides the fauna and flora of the country, they contain much in Physics and Geology, several papers by Maier in human Physiology and Anatomy, and by De Bary in vegetable Physiology.

The *Jahresberichte der Gesellschaft von Freunden der Naturwissenschaften in GERA nebst Nachrichten über den naturwissenschaftlichen Verein in Schleiz*, in very thin annual parts, of which the sixth is for 1863, contain papers on the local fauna and flora.

At GIESSEN in Upper Hesse a Natural-History Society was established in 1846, which has published at intervals of about two years octavo volumes of reports, entitled *Berichte der oberhessischen Gesellschaft für Natur- und Heilkunde*, in which Zoology and Botany appear to be confined to the local flora and fauna.

The *Abhandlungen der naturforschende Gesellschaft in GÖRLITZ*, of which six volumes appeared in small octavo from 1827 to 1851, admitted a great variety of subjects, including Antiquities

and Poetry, with local Zoology and Botany and short isolated notices in the Natural History of South Africa, North America, &c., but apparently nothing worth referring to. Since 1855 there have been five volumes in large octavo; two of a similar character to the others, the three others each with single papers on Geology, Agriculture, and Meteorology.

The Naturforschende Gesellschaft in HALLE was originally established, under the influence of J. C. C. Löwe, in 1779, and published an octavo volume of *Abhandlungen* in 1783, and again two volumes and a part of a third, also in octavo, 1811 to 1817, containing, amongst other matters, a few entomological papers, Nitsche on *Cercarias* and *Bacillarias*, Sprengel's *Umbelliferae*, and Lehmann on some *Boragineae*. In 1853 they commenced Transactions in quarto, to be issued in quarterly parts, forming annual volumes, with much improved typography and plates. The periodical publication, however, was soon abandoned, and the volumes appear irregularly with continuous pagings. The last received is the sixth, dated 1862. Amidst Geology, Mineralogy, Climatology, &c., there are several papers in zoological Physiology and Anatomy, the botanical ones being limited to Irmisch's morphological papers and some long-winded descriptive ones by Schlechtendal.

The Naturwissenschaftliche Verein at HALLE began publishing, at Berlin, in 1848 a *Jahresbericht* in octavo, in annual volumes, which in 1853 became a monthly *Zeitschrift für die gesammten Naturwissenschaften* herausgegeben von dem naturwissenschaftlichen Vereine für Sachsen und Thüringen in Halle, edited by G. G. Giebel and W. Heintz, and formed two volumes octavo for each year, the last received being the tenth, for the second half of 1857. The subjects of the papers are chiefly local, with a few more general ones of little importance. In the year 1860 the Society commenced, under the same editorship, Transactions in large quarto, well got up as to typography and plates, under the title of *Abhandlungen des naturwissenschaftlichen Vereins für Sachsen und Thüringen in Halle*. Of this we have two volumes, dated 1860 and 1861. The papers are doubly paged, for each paper and for the volume, and include several on Palæontology, a long account of South African Diptera by Löw, Giebel on the Osteology of Rodentia, some of Irmisch's papers in botanical Morphology, and some Mathematics.

Of the *Abhandlungen aus dem Gebiete der Naturwissenschaften* herausgegeben von dem naturwissenschaftlichen Vereine

in HAMBURG, quarto, with indifferent plates, there should be, I believe, four volumes. I have only seen the first and third, for 1846 and 1856. They include papers on the Anatomy and Physiology of the lower animals by Stannius, Steinheim, and Wassmann, on Molluscology by Jonas, on Reptiles by R. Schmidt and J. G. Fischer, on Wasps by Möbius, and Sonder's Monograph of *Heliophila*.

The Mittheilungen des Vereins nördlich der Elbe zur Verbreitung naturwissenschaftliche Kenntnisse at KIEL, in thin parts, commenced in 1857, in quarto, in two columns, and has been continued in octavo. It extends to the fourth part, in 1860, and is chiefly geological, with very rarely a zoological paper of little interest.

The Royal Saxon Society of Sciences, divided into classes, publishes Transactions, but with very little of Natural History. The Physical section, entitled Abhandlungen der mathematisch-physikalischen Classe der königlich-sächsischen Gesellschaft der Wissenschaften, LEIPZIG, six volumes, long quarto, 1852 to 1864, contains only a few papers in physiological and cryptogamic Botany by Hofmeister and by Mettenius. There appears also to have been at Leipzig a special Society for Natural History. We have at least a first volume, quarto, with very indifferent plates, dated 1822, under the double title of Acta Societatis Naturæ Scrutatorum Lipsiensis and Schriften der naturforschenden Gesellschaft in Leipzig. It contains in Zoology and Botany a Monograph of *Seydmænus* by P. W. Müller, Schweinitz on North Carolina Fungi, and a few descriptions of plants from botanical gardens. I have not heard of any further publication of the Society.

The Jahresbericht des naturwissenschaftlichen Vereins für das Fürstenthum Lüneburg zu LÜNEBURG, octavo, thirteen years to 1864, contains nothing but local Natural History, and very little of that.

The Jahresberichte des Mannheimer Vereins für Naturkunde, nebst wissenschaftlichen Beiträgen, published at MANNHEIM, in very thin annual parts, octavo, of which the thirtieth is for 1864, contains local Zoology and Botany, mixed in with Astronomy and other physical sciences.

The Schriften der Gesellschaft zur Beförderung der gesammten Naturwissenschaften zu MARBURG, four volumes, octavo, with a very few plates, 1823 to 1839, contain some long speculative papers by Ritgen and others, on garden plants by Wenderoth, and a variety of others of very little interest.

The Archiv des Vereins der Freunde der Naturgeschichte in Mecklenburg, in annual parts, octavo, with a very few plates, edited by E. Boll at NEUBRANDENBURG, had come to its fifteenth year in 1861; and systematic and alphabetical indexes are given for the first ten years. It contains numerous papers on the geology, fauna, and flora of Northern Germany.

The Jahresberichte der Pollichia eines naturwissenschaftlichen Vereins der Rheinpfalz, published at NEUSTADT AN DER HAARDT, in small octavo, with a very few indifferent plates, relate chiefly to the flora, and occasionally to the insect fauna of the country; but they contain also some of Schultz-Bipontinus's papers on Compositæ. One rather thick part or volume is devoted to a description by P. J. Müller of Weissenburg of 232 Brambles from the Palatinate and neighbouring districts. The last part received is the nineteenth year for 1861.

The Abhandlungen der naturhistorischen Gesellschaft zu NÜRNBERG, of which the Royal Society has one volume octavo, 1852, amidst a variety of matter, contain a very little local Zoology and Botany, and an enumeration of Chilian Ferns by J. W. Sturm.

The Berichte des Offenbacher Vereins für Naturkunde über seine Thätigkeit nebst Abhänge wissenschaftliches Inhaltes, OFFENBACH, five thin parts, octavo, 1860 to 1864, contain a few short contributions in Zoology and Botany, on the Cuckoo, on the local flora, &c., with a few plates, of which six are devoted to the Batrachian *Ranunculi*.

The Bohemian Society of Sciences, established at PRAGUE in 1784, published four short series of quarto Transactions in the end of the last and early part of the present century, to which there appears no occasion to refer. A fifth series was commenced in 1837, and continued slowly to the thirteenth volume, which has just appeared in quarto with a very few plates, under the title of Abhandlungen der königlichen böhmischen Gesellschaft der Wissenschaften. The changes in the internal arrangement have been continual—at first the papers indiscriminately following each other, each with a separate paging, but arranged in the Contents in two classes, Physikalisch-mathematische, and Historisch-philologische, then the papers following without order but with a continuous paging, and sorted in the index into five classes, then again forming two or three separate parts in each volume. The volume for some time contained a few Natural-History papers, chiefly speculative, by Haidinger, entomological by Fieber and by

Kolenati, on *Lepidosiren* by Hyrtl, and several botanical ones by Presl, amongst others his *Botanische Bemerkungen* and *Epimeliæ Botanicae*, in which he inundated the science with changes of names and bad species and genera, and, moreover, dated his papers two years before they were actually published. The later volumes contain nothing in our sciences.

The *Verhandlungen des Vereins für Naturkunde zu PRESBURG*, five thin octavo volumes, 1856 to 1861, include Mathematics, Physics, &c., and nothing in Zoology or Botany beyond the fauna and flora of the country.

The Natural History Society of RIGA published for thirteen years, from 1846 to 1863, a *Correspondenzblatt des naturforschenden Vereins zu Riga*, the Numbers for each year forming very thin annual parts, and consisting of Proceedings and short communications, with very little of Zoology or Botany. In 1848 was published also a first volume, octavo, with a few plates, of *Arbeiten des naturforschenden Vereins zu Riga*, in which is Bunge's enumeration of Lehmann's Siberian Plants, as well as some entomological papers by Gimmerthal.

The Entomological Society of STETTIN, apparently in imitation of some of the German botanical periodicals, publishes two journals: 1, the *Entomologische Zeitung herausgegeben von dem entomologischen Vereine zu Stettin*, at first in monthly parts, very small octavo, of one sheet each, but latterly in quarterly parts of a larger octavo, making an annual volumes of 400 to 500 pages, of this we have twenty-two, from 1840 to 1861; and 2, *Linnaea, entomologische Zeitschrift herausgegeben von dem entomologischen Vereine zu Stettin*, in octavo volumes of 300 to 400 pages, with occasionally one or two plates, of which we have fourteen volumes, from 1846 to 1860.

The *Württembergische naturwissenschaftliche Jahreshefte*, edited by Mohl and others, at STUTTGART, in thin annual volumes, octavo, small type, with a few plates, contain a great deal of Geology and Palæontology, Physics, &c., some local Botany and Zoology, especially Entomology, a few physiological and speculative papers, descriptions of two or three Cape animals by Rapp, and a short paper on the Ornithology of Greece by Landbeck. The series is now in its twenty-first year, and general indexes of authors and subjects for the twenty years have been just added.

The *Naturwissenschaftliche Abhandlungen herausgegeben von einer Gesellschaft in Württemberg* at TÜBINGEN, two volumes, octavo, 1827 and 1828, only contain two biological papers, both

in vegetable Physiology one by C. R. Gärtner, the other by F. G. Gmelin.

The *Jahrbücher des Vereins für Naturkunde im Herzogthum Nassau*, at WIESBADEN, in octavo, commenced in 1844, with a part or volume for every year, and extend in our library to the sixteenth for 1861. They comprise papers on Physics, Mineralogy, Geology, Palæontology, &c., with several on the fauna and flora of the country, especially entomological, by Schenck and others.

The *Würzburger naturwissenschaftliche Zeitschrift*, herausgegeben von der physikalisch-medicinischen Gesellschaft at WÜRZBURG, was commenced in 1860, in octavo, with plates, three or four parts forming each volume, of which the fifth was completed in 1864. It contains physical, geological, and palæontological papers, and in Zoology and Botany chiefly anatomical (by Kölliker, Claus, and others) or histological. A few zoological and botanical papers, chiefly physiological, are also contained in the *Verhandlungen der physikalisch-medicinischen Gesellschaft in Würzburg*, large octavo, ten volumes.

I have met also with references to Reports of Proceedings, Journals, or Transactions, published by Natural-History Societies at ALTENBURG, ANHALT in DESSAU, AUGSBURG, BAMBERG, BLANKENBURG, CASSEL, CREFELD, DORPAT, ELBERFELD, EMDEN (*Jahresberichte und kleine Schriften*; I have only seen the former without the papers), HANAU, HANNOVER, HEIDELBERG, KLAGENFURT, and MAJA, which are otherwise unknown to me.

There are also numerous scientific Societies in Germany which, without professing to deal specially with Natural History, occasionally include zoological or botanical papers in their Transactions, especially medical, agricultural, and horticultural Societies. Among the latter the Prussian Society will be alluded to further on, under Horticultural Periodicals.

2. *Journals not connected with Scientific Societies.*

Before the great French revolution had overrun Germany, producing a general disorganization of scientific enterprise, several natural-historical, and especially botanical periodicals, had been attempted, and some of them had obtained circulation even in this country, and are still occasionally quoted, especially for the European flora. The principal ones, more or less known to me, chiefly on the old unsightly German paper, with a few very indifferent plates, are the following:—

In general Natural History and Zoology—

Magazin für das Neueste aus der Physik und Naturgeschichte, edited at GOTHÄ, at first by Lichtenberg, and afterwards by Voigt, eleven volumes, small octavo, and one of index, 1781 to 1799, continued at Jena and afterwards at Weimar by Voigt, in twelve volumes, 1797 to 1806, under the title of Magazin für den neuesten Zustand der Naturkunde, mit Rücksicht auf die dazu gehörigen Hülfswissenschaften, contains, amongst a variety of matter, short zoological original communications, and a very few botanical ones.

Der Naturforscher, HALLE, seven volumes, octavo, 1777 to 1780, Höpfner's Magazin für die Naturkunde, ZÜRICH, four volumes, octavo, 1787 to 1789, and Scriba's Journal für die Liebhaber der Entomologie, FRANKFORT, three parts, 1790 and 1791, neither of which have I seen.

Meyer's zoologische Annalen, WEIMAR, 1794, one volume, octavo, for 1793, is chiefly a summary of the zoological progress for that year, and does not appear to have been continued.

Wiedemann's Archiv für Zoologie und Zootomie, five volumes, octavo, BERLIN, 1800 to 1806, contains many original papers by Wiedemann, Schröter, Illiger, Schelver, and others, besides extracts and translations from English and French publications.

Weber and Mohr's Beiträge zur Naturkunde, one volume, small octavo, KIEL, 1805, contains a few papers in Botany, Entomology, and Mineralogy.

In Botany, either exclusively or chiefly—

Ehrhart's Beiträge zur Naturkunde und den damit verwandten Wissenschaften, seven volumes, small octavo, HANOVER and BRUNSWICK, 1787 to 1792. A few chemical and medical papers are mixed in with the botanical ones.

Römer and Usteri's Botanisches Magazin, or Magazin für die Botanik, twelve parts making four volumes, small octavo, ZÜRICH, 1787 to 1790.

Usteri's Annalen der Botanick, six parts, small octavo, ZÜRICH, 1791 to 1794, and Neue Annalen der Botanick (afterwards Botanik), fifteen volumes or parts, small octavo, ZÜRICH, afterwards LEIPZIG, 1795 to 1797, the latter series also called volumes 7 to 21 of the Annalen.

Römer's Neues Magazin für die Botanik in ihrem ganzen Umfange, one volume, small octavo, ZÜRICH, 1794, and Archiv für die Botanik, three volumes, small quarto, 1796 to 1805.

Schrader's Journal für die Botanik, ten parts, small octavo,

GÖTTINGEN, 1799 to 1803, and *Neues Journal für die Botanik*, eight parts in four volumes, 1805 to 1810.

The following are the principal Zoological and Botanical Journals now being carried on in Germany under private editorship:—

The *Linnæa*, ein Journal für die Botanik in ihrem ganzen Umfange, in small octavo, with a very few plates, was established by Schlechtendal at BERLIN in 1826, and, moving with him to HALLE in 1833 or 1834, has continued under his editorship and, I believe, proprietorship to the present time. It appears in parts, of which about six make a volume, and it was intended at first that the volumes should correspond to the year, but having, after some years, got into arrear, the attempt at absolute regularity in issue was given up, without losing sight altogether of the original plan of about a volume a year. It consists chiefly of systematic and descriptive papers; and from the first, when the editor, in conjunction with Chamisso, commenced the publication in it of the results of the voyage round the world of the latter botanist, to the present day, there has been much of considerable value which we have frequent occasion to refer to. It also contained bibliographical notices, which were at first given at the end of each part, with a continuous paging; then, from the third volume (1828) to the sixteenth (1842), they were separated by a distinct paging, title-page, and index for each volume, under the name of *Litteraturberichte der Linnæa*. With the seventeenth volume (1843) the bibliographical articles were discontinued, being reserved for the *Botanische Zeitung*; and to the old title of *Linnæa* was added the second one of *Beiträge zur Pflanzenkunde*, of which this was the first volume. This seems to be a useless complication; for the work is always quoted as the *Linnæa*, and the double title and numbering of volumes, if noticed at all, only creates confusion. It is now, after thirty-nine years, in the thirty-fourth volume, or eighteenth of the *Beiträge*. Each volume has a table of contents and index of names.

With the above-mentioned change in the *Linnæa* (in 1843) a separate botanical Journal was commenced, something after the plan of the *Ratisbon Flora*, under the editorship of Mohl and Schlechtendal, at BERLIN. It appears in weekly numbers of one sheet each, with occasionally an additional half sheet, and now and then a plate, each year forming a volume in foolscap quarto, in two columns, on thin paper; each volume, like the *Flora*, has a classified index. In the first fifteen years the

columns were numbered as pages; from the sixteenth (1858), it is the pages only of two columns that are numbered. The Journal still appears regularly, and is now in its twenty-third year. Besides reviews, bibliographical notices, and botanical intelligence, there are original articles, occupying perhaps on an average the half of each number. These are more generally physiological than systematic or descriptive; but there are frequently also short articles of the latter class, and for the last two years papers too long to be broken up into the weekly numbers are given in extra sheets with separate pagings. To meet the extra expense of these additions, as well as of the increased number of plates now given, the subscription price has been lately raised.

Wiegmann's *Archiv für Naturgeschichte*, octavo, with good plates, was commenced in 1835 at BERLIN, in parts, forming two volumes for each year. In the first year, the reports on the progress of Zoology and Botany were mixed up with the original papers in each volume, but from the second year the first volume of each year is devoted to original papers, and the second to the reports. This important Journal was edited by Wiegmann until his death in 1841, its seventh year. It was then continued by Erichson, and, on his death in 1848, by Troschel, who still carries it on, and who has given also general indexes of names of authors and of subjects of the original papers of the first twenty-five years. The last part received is the fourth of the thirtieth year (1864). The original papers of the series are chiefly zoological, descriptive as well as physiological; the few botanical ones are generally physiological; the annual reports on the progress of the different branches of science during the preceding year are most valuable, and, I believe, well kept up in all the different branches of Zoology. In Botany, although so well commenced by Meyen and others, they have unfortunately not been continued, probably owing to Beilschmied's translations of the Swedish ones above mentioned. But these have long since ceased, and it were much to be desired that they might be again taken up by some German compilers, who have great facilities for carrying out works of the kind at a moderate cost. Still more satisfactory would it be to us, if, now that zoological reports of the kind have been undertaken in this country under the direction of Dr. Günther, some of our own botanists would render the same service to Botany.

Siebold and Kölliker's *Zeitschrift für wissenschaftliche Zoologie*, LEIPZIG, octavo, in parts, of which four make a volume for

each year, with numerous plates, is limited to zoological Physiology and Anatomy, to the express exclusion of systematic and descriptive papers. It commenced in 1851, and is now in its fifteenth annual volume for 1865.

Pringsheim's *Jahrbücher der wissenschaftlichen Botanik*, BERLIN, afterwards LEIPZIG, large octavo, with plates, begun in 1857, in quarterly parts, of which four were to form an annual volume, are still however only in their fourth volume. This work also is specially destined for Physiology and Anatomy. Systematic and descriptive Botany are only admitted for microscopic plants or algæ, and others of the lower orders of cryptogams, with the sole exception of Caspary's paper on *Hydrilla*.

In both the above publications we regret to see currency given to a mischievous misuse of the word *scientific*, now prevalent among many Germans—mischievous in its tendency to cast a slur upon system and methodical description as necessarily unscientific, although they had only become so at the close of last century, by a misinterpretation of Linnean principles now happily better understood. If the study of the phenomena of life may lead to higher results than that of outward form and structure, the one cannot be carried on without the other, and if microscopical structure is more difficult to observe than that which is visible to the naked eye, the one is not more important than the other. Physiological differences in living beings are more or less correlative to differences in form and structure; and to have clear ideas in relation to them the subjects of observation must be accurately identified and judiciously classed; and, on the other hand, no description or system is good unless physiology and structure are taken into consideration as well as outward form. Speculations therefore in biology, without an accurate knowledge of individuals and systematic affinities, or microscopic observations unchecked by what can be ascertained without the aid of the instrument, are surely as unscientific as the rude systems of mere collectors where outward visible form alone is considered.

Skofitz's *Österreichisches botanisches Wochenblatt*, at VIENNA, formed seven annual volumes, octavo, from 1851 to 1857, and has been continued, from 1858, under the title of *Öesterrreichische botanische Zeitschrift*, now in its eighth volume. It contains botanical bibliography and intelligence, papers on Horticulture and local Botany, and occasionally short monographs or other articles on general Botany, descriptions of new plants, &c.

Cabanis and Baldamas's *Journal für Ornithologie*, published at

CASSEL, in octavo, with a few plates, is now in its thirteenth annual volume.

Hedwigia, ein Notizblatt für kryptogamische Studien, nebst Repertorium für kryptogamische Litteratur, DRESDEN, octavo, ten numbers to 1864, is unknown to me.

The following, although comparatively modern, have now, I believe, all ceased to appear.

Oken's Isis had for a short time a very considerable reputation in Germany as a general Journal of Natural History and the organ of his peculiar views. It was published in quarto numbers, in two columns, on old German paper, forming annual volumes with literary supplements, and was continued for thirty-two years, from 1817 till the close of the author's life in 1848, or soon after. The subjects are chiefly of temporary interest, reviews, abstracts, short notices, and scientific intelligence; but there are also a few short original papers in Zoology and Botany, and occasionally a few plates of indifferent execution.

Flörke's Repertorium des Neuesten und Wissenswertigsten aus der gesammten Naturkunde, five volumes, octavo, with a few plates, BERLIN, 1811 to 1813, consists almost entirely of abstracts or translations of papers elsewhere published.

Froriep's Notizen aus dem Gebiete der Natur- und Heilkunde, WEIMAR, quarto, in two columns, with a few plates, was published in numbers, forming 101 thin volumes, in three series, 1822 to 1848. Each number is divided into two parts, for Natural History and Medicine. The work consists in a great measure of translations, abstracts, reviews, and intelligence; but also includes a few short original zoological and botanical papers, chiefly physiological, and of little importance.

D'Alton and Burmeister's Zeitung für Zoologie, Zootomie und Palæozoologie, was commenced at LEIPZIG in January 1848, in quarto numbers, in two columns, of one or two sheets each; but after being carried on to the twenty-sixth number in September of the following year, it was dropped for want of support. It consists of original papers and bibliographical notices.

Germar's Magazin der Entomologie, four volumes, octavo, with a few plates, HALLE, 1813 to 1821, contains original papers, as well as reviews and abstracts. His subsequent series, Zeitschrift für die Entomologie, three volumes, LEIPZIG, 1839 to 1841, chiefly consists of original entomological descriptive papers.

Of Gistel's Faunus, Zeitschrift für Zoologie und vergleichende Anatomie, there appear to be only three thin octavo volumes, MÜ-

NICH—the first two dated 1832 and 1855, and the third, called the first of a second series, 1837: they contain a few original papers, with several extracts and abstracts.

Gistel's *Vacuna, oder die Geheimnisse aus der organischen und leblosen Welt*, two volumes, octavo, STRAUBING, 1857, with a great deal of irrelevant matter, contains some papers on the local flora, and some of Gistel's own in Entomology.

Sprengel, Schrader, and Link's *Jahrbücher der Gewächskunde*, three parts forming one volume, octavo, BERLIN, 1820, besides translations and abstracts, contain a few original papers by Swartz, Link, Treviranus, Ehrenberg, and Sprengel.

Sprengel's *Neue Entdeckungen im ganzen Umfang der Pflanzenkunde*, three volumes, foolscap octavo, with a few plates, LEIPZIG, 1820 to 1822, consists chiefly of reviews, abstracts, and extracts, but contains also a few original papers of his own, and one by Trinius.

Rabenhorst's *Botanisches Centralblatt* is unknown to me.

Seemann's *Bonplandia, Zeitschrift für die gesammte Botanik*, published at BONN, in separate numbers of about a sheet each, forming annual volumes, long quarto, in two columns, was commenced in 1853. It contains, besides bibliographical notices and botanical intelligence, short original papers in descriptive as well as physiological Botany, but exceedingly difficult to find, the preparation of the indexes to each volume having been unfortunately left to some ignorant compiler, who has resorted to the most ingenious contrivance for rendering them useless: the alphabetical arrangement is neither that of subjects nor of authors, but of the first word of the titles of the articles, whether it be an article, a preposition, or a noun. The Journal was carried on to the tenth year (1862), when it ceased, after having in the last volumes commenced giving a few plates.

The German Horticultural periodicals are numerous, but most of them of mere temporary or local interest. A few, however, contain botanical papers or descriptions which we are compelled to take notice of. The most important are the following:—

The *Verhandlungen des Vereins zur Beförderung des Gartenbaues in den königlichen preussischen Staaten*, at BERLIN, contain reports of the Society's Meetings, with a few papers read, occasionally botanical, and a very few plates of new plants. The first series is in twenty-one volumes, quarto, 1830 to 1853, followed by a second in octavo, seven volumes, 1853 to 1859, when the work appears to have been given up, having been replaced by

K. Koch and Fintelmann's *Wochenschrift für Gärtnerei und Pflanzenkunde*, quarto, in two columns, which has formed annual volumes since 1858, and is still carried on.

The *Hamburger Garten- und Blumen-Zeitung*, published at HAMBURG, in monthly parts, octavo, forming annual volumes with a few plates, is now in its twenty-first year. It was commenced in 1845 as *Neue allgemeine deutsche Garten- und Blumen-Zeitung*, under the editorship of R. Mettler, continued by Otto from the fourth volume (1848), and changed its name to *Hamburger Garten- und Blumen-Zeitung* with the seventh volume, 1851. It frequently contains short botanical papers, especially descriptions of new plants.

Regel's *Gartenflora, Monatschrift für deutsche und schweizerische Garten- und Blumenkunde*, was commenced at ERLANGEN in 1852, in monthly numbers, octavo, with coloured plates, in some measure in imitation of our periodicals of the kind, but often very inferior in execution. It still continues to be dated from Erlangen, although the editor has been for several years Director of the Botanic Garden of St. Petersburg. It is now in its fourteenth year, and contains numerous descriptions of garden species, supposed to be new, although many unfortunately will not bear the test of a close examination. This leads one to suspect that Regel himself, who in other works has shown a sound appreciation of the value of species, may not have so much to do with the details of this one as his name on the title-page would imply.

Baron Hügel commenced at VIENNA, in 1837, a *Botanisches Archiv der Gartenbaugesellschaft der österreichischen Kaiserstaaten*, in octavo, with coloured plates, to be issued monthly, in close imitation of our *Botanical Magazine*, but it was never continued beyond the second part.

XI. SWITZERLAND.

The General Swiss Natural History Society published a first volume in quarto, in two parts, dated at ZURICH, 1829 and 1833, of *Denkschriften der allgemeinen schweizerischen Gesellschaft für die gesammte Naturwissenschaften*. The papers it contains are chiefly geological; the only biological contribution is a short one by De Candolle on *Fatua*. This volume was followed in 1837 by a new series, entitled *Neue Denkschriften*, &c., also with the French title of *Nouveaux Mémoires de la Société Helvétique des Sciences Naturelles*, of which we have now eighteen volumes, the

first ten, 1837 to 1849, published at NEUCHÂTEL, the eleventh to the eighteenth, 1850 to 1861, at ZÜRICH. They contain a great deal of interesting palæontological and geological matter by Heer and others, much of geology, long papers on the Swiss fauna and flora, a few more general entomological and physiological memoirs, one on the Radiata and Worms of Nice by Ed. Graeffe, two by De Candolle, on Monstrosities and on *Gærtnera*, and J. Mueller's monograph of Resedaceæ. There are separate pagings for the different papers, which are in the French or German language, with more or less of Latin for the technical parts.

The Mémoires de la Société de Physique et d'Histoire Naturelle de GENÈVE, quarto, with very fair plates, commenced rather earlier than those of the general Swiss Society, the first volume being dated 1821, and the volumes succeeding each other pretty regularly to the twelfth in 1849. Since then there have appeared but five, the last received being the seventeenth, dated 1863, but published in 1864. Physics, Geology, and vegetable and animal Physiology, including Claparède on the fécondation of Nematodes, occupy a considerable portion. There are also several important monographs and other memoirs in systematic Botany by De Candolle and his friends and pupils Duby, Choisy, Moricand, and Coulter, a Flora of Zante by Margot and Reuter, and some papers on Mexican Crustacea, Myriapods, and Insects by H. de Saussure.

The well-known Bibliothèque Universelle of Geneva, now in its seventieth year or twenty-fourth volume of the present series, octavo, in its scientific portion, although chiefly physical, contains frequently zoological and botanical reviews and intelligence, and occasionally an original paper, especially in the speculative or theoretical branches of these sciences.

At LAUSANNE, from a cantonal section of the Société Helvétique des Sciences Naturelles, gradually arose the Société Vaudoise des Sciences Naturelles, which, from 1842, has published a regular Bulletin des séances de la Société, &c. in octavo, with occasional plates. It is now in its eighth volume. The papers are chiefly in Physics, Geology, and Palæontology; the few in Zoology and Botany are of little beyond local interest.

The Verhandlungen der naturforschenden Gesellschaft in BASEL, in octavo, commenced in 1857, and are now in their fourth volume. The few zoological and botanical papers are again of scarcely any but local interest.

Professor F. Meisner published at BERNE in 1824 two small vo-

lumes, foolscap octavo, of *Annalen der allgemeinen schweizerischen Gesellschaft für die gesammten Naturwissenschaften*, containing in zoology and botany a few speculative and physiological papers, and some on the local flora and fauna of very little importance.

The Society of Naturalists of BERNE, at first a cantonal section of the *Société Helvétique des Sciences Naturelles*, began publishing in 1843, as an independent Society, *Mittheilungen der naturforschenden Gesellschaft in Bern*, in octavo, in separate numbers, forming thin annual volumes, of which there are twenty-two from 1843 to 1864, with a very few plates in the latter ones and a general index for the years 1843 to 1854. The papers are chiefly in Physics; the Zoology and Botany are entirely local, except a few morphological contributions of Wydler's, and Shuttleworth's paper on the Mollusca of the Canary Islands, &c.

The *Société des Sciences Naturelles de NEUCHÂTEL* was founded in 1832, and have published four volumes of *Transactions*, large quarto, with plates, 1835 to 1859, containing, besides Geology and miscellaneous subjects, some zoological papers, especially on the Anatomy of *Salmones*, by Agassiz and Vogt, and other papers of Agassiz, a classification of Batrachia by Tschudi, &c., the few in Botany relating to the mosses and other plants of Switzerland. The *Bulletin* of the same Society, five volumes, octavo, 1844 to 1861, contains, amidst a great variety of matter, very little of Zoology (chiefly short communications and extracts by the President, L. Coulon) and still less of Botany.

The Natural-History Society of ZÜRICH commenced in 1847 publishing monthly numbers, forming thin annual octavo volumes, of *Mittheilungen der naturforschenden Gesellschaft in Zürich*, which continued till the tenth year (1856), and were followed by quarterly parts, entitled *Vierteljahresschrift der naturforschenden Gesellschaft in Zürich*, edited by R. Wolf. Notwithstanding the title, the papers are chiefly mathematical, physical, or chemical, with a few zoological, including physiological contributions from Kölliker, and conchyliological by Mousson, &c.; and scarcely any botanical, and those of no importance. The last I have seen is the eighth year (1863).

I have met also with references to *Jahresberichte* of Natural-History Societies at CHUR in the Grisons and at ST. GALLEN, neither of which have I seen.

XII. FRANCE.

The old *Académie des Sciences* of PARIS had, in the latter half of the seventeenth century, and during the eighteenth century,

published about 130 quarto volumes of *Histoire* and *Mémoires*, when it was suppressed in the great French Revolution. Reestablished a short time afterwards as a class of the National Institute of Sciences and Arts, it issued, under the Republic and Empire, from the an vi. (1798) to 1815, fifteen volumes of *Mémoires de l'Institut National des Sciences et Arts, Sciences Mathématiques et Physiques*, including a few Natural-History papers by Cuvier, Lacépède, Ventenat, Desfontaines, and others. In 1815 the Institute was again reorganized, and the old name of Academy of Sciences restored to the Mathematico-physical branch, and two new series of quarto Transactions were commenced. Of the one, entitled *Mémoires de l'Académie des Sciences de l'Institut* (with or without the epithet of Royal or Imperial, according to the political atmosphere of the day) de France, we have thirty-three volumes up to 1864; of the other, the *Mémoires présentés par divers savants à l'Académie (Royale or Impériale) des Sciences de l'Institut de France*, seventeen volumes to 1862. In this long series the Natural-History papers scarcely average above one in every two volumes; and although two or three of the more important ones, each occupying the whole, or nearly the whole, of a volume, may be considered as so many independent works published under the sanction of the Academy, yet it is to be regretted that the shorter ones should be thus, here as in other cases, buried in the mass of the more abstruse sciences into which the naturalist cannot enter. With the exception of two unimportant papers in the earlier volumes, Ramond on the Vegetation of the Pic du Midi and Delile on *Benincasa*, and of Duméril's classifications of Fish, Reptiles, and Insects, the whole of the zoological and botanical memoirs in these volumes relate to animal and vegetable Anatomy and Physiology; the zoological ones (in chronological order) in the *Mémoires de l'Académie* by Flourens, Geoffroy de St. Hilaire, Milne-Edwards, Breschet, Duvernoy, De Serres, and Quatrefages; and in the *Mémoires de divers savants* by Duvernoy, Léon Dufour, Baudrimont, Martin de St. Ange, Robineau-Desvoidy, Breschet, Dugès, Cortes, Bourguignon, and Lereboullet; the botanical in the *Mémoires de l'Académie* by Mirbel, Dutrochet, A. de St. Hilaire, Turpin, Mirbel, and Payen; and in the *Mémoires de divers savants* by Couverchel, C. H. Shutz, Gaudichaud, Payen, Duchartre, and W. R. Schimper.

The full reports of the weekly meetings of the Academy, so well known under the name of *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, in a small quarto form, com-

menced in 1835, forming two volumes in each year, and are now in their sixtieth volume.

The greater number, however, of the Natural-History papers of the French Academicians, especially during the first half of the present century, appeared in the several series issued under the authority of the Jardin des Plantes, which it were much to be wished were more actively continued, as the receptacle for all important memoirs on these subjects requiring quarto illustrations. The first of these series, entitled *Annales du Muséum National d'Histoire Naturelle par les Professeurs de cet établissement*, was in twenty volumes, quarto, with numerous plates, 1802 to 1813, the epithet National being dropped with the sixth volume, 1805, never to be resumed by the editing Professors, who have even disdained the adjuncts of Royal or Impérial. The second series, also in twenty volumes, appeared as *Mémoires du Muséum d'Histoire Naturelle par les Professeurs de cet établissement*, extended from 1815 to 1832, since when a third series, entitled *Archives du Muséum d'Histoire Naturelle par les Professeurs-Administrateurs de cet établissement*, has been dragging on its broken life through nine volumes and a half in thirty years, none having appeared since the second part of the tenth volume in 1861. These fifty volumes include Mineralogy and Geology, but comprise also in Zoology and Botany many of the most important contributions of the most eminent French naturalists, especially systematic and structural, with a few physiological ones; and the illustrations, especially some of those of the Archives, as for instance Adrien de Jussieu's Malpighiaceæ, may well be given as models in point of design and execution.

A Natural-History Society appears to have existed in Paris from the year 1770, although perhaps never regularly constituted till 1788; and the first publication was not till 1792, when a thin folio was issued entitled *Actes de la Société d'Histoire Naturelle de Paris*. Stopped for a time by the political convulsions of the day, it made another attempt in the an vii. (1799), and produced a thin quarto under the title of *Mémoires de la Société d'Histoire Naturelle de Paris*, and was again silent until 1823, when, ignoring the former volume, and without any indication of its being a new series, it began again with a first volume with the same title of *Mémoires de la Société d'Histoire Naturelle de Paris*, and carried it on to the fifth volume in 1834, when it appears to have expired. These volumes contain, besides geological, palæontological, chemical and other contributions, a few entomolo-

gical and malacological, some in zoological Anatomy and Physiology, by Milne-Edwards, &c., and several botanical monographs and other descriptive papers, in the *Actes* by the elder Richard, in the single quarto by De Candolle and others, and in the five volumes by several modern botanists, including De Candolle, Walker-Arnott, Achille Richard, Choisy, Laharpe, J. Gay, &c.

During this intermittent career of the *Société d'Histoire Naturelle* another one was started in 1820 under the name of *Société Linnéenne de Paris*, and claimed to be the original one, which it is stated was established in 1788 under that name, and only changed it in 1790 to *Société d'Histoire Naturelle* in deference to some anti-Linnæans, who were then amongst its leading members. However that may be, this new or old Linnean Society commenced in 1822 annual volumes in octavo, with plates in quarto, of *Mémoires de la Société Linnéenne de Paris*, and carried them on through five volumes, and a portion of the sixth, to 1827. With the original papers were also reports of Proceedings, Programmes, Biographical notices, &c., with separate pagings; and the two together bore on the temporary covers the title of *Annales de la Société Linnéenne de Paris*, under which the work is sometimes quoted, but it is more generally known as *Mémoires*. It contains a few entomological and other zoological papers; but the principal ones are botanical, including Dumont d'Urville's *Oriental Plants*, several of Desvaux's *Monographs*, Rapin's *Plantagineæ*, &c. I have not seen the second volume, which is deficient in both the copies I have consulted.

The Entomological Society founded at Paris in 1832 immediately commenced publishing *Transactions*, in parts, forming annual volumes, in octavo, with plates, which, rather indifferent at first, have gradually improved and are now very good. This work, entitled *Annales de la Société Entomologique de France*, still continues, and has been broken up into several series. After the eleventh volume (1842) a change was made in the editorship, and a second series commenced, extending, in ten volumes, to 1852; the third series has eight volumes to 1860; and the fourth series, now in its fourth volume, commenced in 1861, in a new, more compact type and on improved paper, so as to reduce the thickness of the volume, which had become unwieldy. The papers are exclusively entomological, and chiefly systematic and descriptive.

The *Société Impériale Zoologique d'Acclimatation*, established in the Bois de Boulogne at Paris in 1854, publishes a *Bulletin* in

octavo, in parts, forming annual volumes. They relate chiefly to the education, introduction, and so-called acclimatization of animals, but contain also papers on animal physiology, geographical distribution, &c. There are nine volumes complete from 1854 to 1862.

In 1854 also an entirely new Society was formed by the leading botanists of Paris, strictly limited to Botany, but on an extensive scale, its permanent abode and meetings for the greater part of the year being in Paris; but every summer it meets for a week at some provincial town or other locality of botanical interest, to be changed every year. The Society immediately began publishing a *Bulletin de la Société Botanique de France*, in large octavo, and small type, but without plates, in parts, forming annual volumes. It is now in its twelfth; the issue, however, has been very irregular, often appearing long after the dates assigned; and the titles and indexes to several of the last volumes have not yet been received. A large portion is occupied by bibliographical notices, not the less useful from criticism being rigidly excluded, and by long reports of the meetings, often of temporary interest only. As, however, the most eminent French botanists take a part in the proceedings, the reports often include short papers *in extenso*, and records of facts and observations, in physiological as well as in structural and systematic Botany, of considerable importance.

Lamarck and others at Paris commenced in 1792 a *Journal d'Histoire Naturelle*, published in parts, in octavo, with plates; but, after completing two volumes in the course of the year, it came to an end in the disorders of the Revolution. It contains some good papers in various branches of Natural History.

It was not until the year 1824 that it was replaced by the *Annales des Sciences Naturelles*. This important periodical was then commenced under the editorship of Adolphe Brongniart and others, appearing in monthly numbers, forming in each year three volumes octavo of text, with a few quarto plates, intended to be separately bound up. It was carried out on the same plan through a first series of thirty volumes or ten years, to 1833, comprising geological and mineralogical papers as well as Zoology and Botany. In 1834 a second series was commenced on an improved plan: Mineralogy and Geology were altogether rejected; and Zoology and Botany were separated into distinct sections, each with its own paging, title, and indexes; at the same time the plates were reduced to the somewhat enlarged form adopted for the text.

And in this form it has continued till now, at first endeavouring to issue a part for each month, half Zoology and half Botany, forming two volumes for each year; but the parts having gradually got much in arrear, and one branch having had often to wait for the other, the custom of assigning a specific month for each issue has been discontinued; the Zoology and Botany generally appear separately at irregular intervals; but six parts continue to form a volume, and a new series is commenced after every twenty volumes; copious indexes, both of subjects and of authors, being given to every volume as well as to every series. It is now in the third volume of the fifth series, or ninety-third of the whole work. Besides occasional reviews or translations, it contains throughout many most valuable original papers in every department of both sciences, with the great advantage that neither the zoologist nor the botanist has to encumber his shelves with what does not relate to his own branch.

De Férussac's useful Bulletin for four years previous to 1824 included all sciences in one publication; but in that year a division was made into eight separate series, published in numbers, forming one or two annual volumes, octavo, for each series. The Bulletin des Sciences Naturelles et de Géologie was carried on through twenty-six volumes, from 1824 to 1831. Although chiefly consisting of bibliographical notices, abstracts, and intelligence, it also contained occasionally short communications, both in Zoology and Botany, not elsewhere published.

The Magasin de Zoologie, conducted by Guérin-Méneville, was commenced in 1831, to be issued in monthly parts, forming two or three annual volumes, octavo, with numerous plates. The parts, however, were very soon much in arrear; and after the first two years only one volume was ascribed to each year, and in 1839 a new series was commenced with the enlarged title of Magasin de Zoologie, d'Anatomie comparée et de Paléontologie, on the same plan of an annual volume in six parts. This Magazine admitted only original papers, but a bulletin was occasionally added; and from 1838 the same editor published a monthly Journal, also in octavo, entitled *Revue Zoologique par la Société Cuvérienne*, devoted to reviews, bibliographical notices, and other zoological intelligence, together with abstracts of zoological papers read at the Académie des Sciences or other scientific bodies at Paris. Both these periodicals again got much in arrear, especially the Magasin; but at length (in 1849) the editor having succeeded in obtaining from Government that assistance which is so fre-

quently given abroad to publishing scientific Societies and Journals, commenced a new series, combining the two under the title of *Revue et Magasin de Zoologie pure et appliquée*. This work is now in the seventeenth yearly volume of the series, or twenty-eighth of the whole work.

The *Journal de Conchyliologie*, in octavo, with plates, exclusively devoted to Mollusca, and chiefly to their shells, was established in 1850 under the direction of Petit de la Saussaie. Four volumes formed a first series to 1853. In 1856 a second series was commenced under the direction of Fischer and Bernardi, and carried on to a fourth volume, dated 1860, since which there are two complete volumes of a third series, conducted by Crosse, Fischer, and Bernardi.

For Botany alone Desvaux had established a *Journal de Botanique*, in octavo, in 1808, which was carried on till 1814, in parts, forming five volumes. There are in it a few of Desvaux's own descriptive papers, but generally very little that we have now occasion to refer to.

Guillemin again in 1833 started a monthly *Journal of Botany*, in octavo, entitled *Archives de Botanique*; but although it was supported by several of the principal French botanists, who contributed original papers, it only lasted a single year, forming two volumes, with a few plates.

Duchartre's *Revue Botanique*, in monthly parts, octavo, forming two volumes for 1846 and 1847, although professedly devoted to reviews and bibliographical notices, contains also a few short original papers by J. Gay and others.

The *Revue Horticole*, appearing also in numbers, forming annual volumes, at first small octavo, and now large octavo, has had twenty-one volumes in four series, and is now in the fifth of the fifth series; but the volumes are no longer numbered, but only designated by the year of publication. Although chiefly devoted to horticulture, it contains some botanical papers by Decaisne and others, which we have occasionally to refer to.

The *Bulletin de la Société Linnéenne du Nord de la France*, at ABBEVILLE, one volume, octavo, 1840, with a few plates, contains papers on local Malacology and Entomology, and has not since been continued.

The *Annales de la Société Linnéenne du Département de Maine et Loire*, at ANGERS, extends to four thin volumes, large octavo, 1854 to 1861, with plates, very well got up as to typography. It contains many papers on the local fauna and flora, especially birds,

mollusca, insects, and fungi, and several in vegetable physiology, diversified by geology, statistics, poetry, heraldry, &c.

The Linnean Society of BORDEAUX, commencing in 1826, has published twenty-four volumes, octavo, to 1863, of Proceedings and Transactions, of which the Royal Society has eighteen to 1852. The first three are under the title of Bulletin d'Histoire Naturelle de la Société Linnéenne de Bordeaux, the remainder as Actes de la Société Linnéenne de Bordeaux. There are a very few plates, chiefly in the latter volumes. There is in the series much of geology and palæontology, the zoology and botany relating almost entirely to the fauna and flora of the country. There are also a few papers on the anatomy and physiology of insects, by Léon Dufour, and in physiological and general botany of little importance by Charles des Moulins and others; and in the sixth volume is one of those short communications in which Rafinesque sought to encumber botanical science with a long batch of useless generic names.

A Linnean Society established at CAEN, commenced publishing Memoirs in octavo in 1824, under the title of Mémoires de la Société Linnéenne du Calvados. With the third volume (in 1826-27) it had changed to Mémoires de la Société Linnéenne de Normandie; and with the sixth volume the octavo form was exchanged for the quarto, and the Memoirs have now, I believe, been brought down to the thirteenth. I have only seen, however, the five octavo volumes, which contain papers on the local geology, malacology, entomology, and botany, with a general monograph of some genera of lichens, by Delise. In 1856 the Society commenced also a Bulletin de la Société Linnéenne de Normandie, in octavo, with a few plates, of which we have only the last two volumes, the eighth and the ninth, containing, besides reports of Proceedings, original papers, often of considerable length, in which geology and palæontology occupy a great space. There are also entomological papers, European and exotic, by E. Eudes-Deslongchamps and A. Fauvel; descriptions of a supposed new Californian genus of Liliaceæ (*Rupellaga*, Morière, probably the same as *Streptolirion*, Torr.), and of several new genera and species of New Caledonian plants, by Vieillard, being, with the Annales des Sciences Naturelles of Paris and the Lyons Mémoires above mentioned, the third receptacle for the simultaneous publication of these plants, to the great confusion of their synonymy.

The Société des Sciences Naturelles de CHERBOURG was established in 1852, and very soon became Société Impériale, and began

publishing *Mémoires*, in octavo, with occasionally a few plates. In the tenth, for 1864, the last received, is a general classified index. Physics, geology, medical and industrial sciences occupy a large space. In zoology and botany, besides the local fauna and flora, there are several papers on the fauna of New Caledonia by Jouan, and of the Marquesas by Jardin, entomological communications by Mulsant, Rey, Bertrand-Lachenée and others, in botanical physiology and teratology by Le Jolis, Bertrand-Lachenée and others, algological by Le Jolis, Thuret, and Brébisson; and valuable lichenological papers by Nylander, besides a few unimportant ones on the botany of the Pacific islands.

LYONS publishes three contemporaneous series of scientific Transactions, to all of which their entomologists, at least, contribute Natural-History papers. The scientific branch of the principal Academy (Royal, National, or Imperial, according to the ruler of the day) began in 1845 their *Mémoires de l'Académie Royale des Sciences, Belles-Lettres, et Arts de Lyon, Section des Sciences* (in the title-page; *Classe des Sciences* on the cover), in octavo. The first series comprises two meagre volumes, dated 1845 and 1847, but including papers read in 1849. The only Natural-History papers are three short entomological ones in the second volume, with one small plate, the only one in the series. In 1851 a new series was commenced, of an enlarged size (imperial octavo), with the same title, except that the *Académie Royale* had become *Nationale*, and the words *Nouvelle Série* were added. In the second volume (1852) the word *Nationale* was exchanged for *Impériale*, and in the third the size was reduced to an intermediate one between the two previous ones. This form still continues up to the last volume received, the twelfth, dated 1862. In the first ten volumes of this series are numerous entomological papers of E. Mulsant and his collaborators, and in the earlier ones several of Jordan's contributions, both speculative as to his peculiar view of species, and descriptive of some of the innumerable forms he adds to the French Flora. In the tenth volume, also, 1860, the Missionary Father Montrousier (or Montrouzier) gives a Flora of the Island of Art, off the north coast of New Caledonia, with descriptions of numerous new genera and species. It does not appear what means the author had for determining and comparing his species, nor what were his reasons for publishing in these little-known Transactions, without communication with the Parisian botanists, who were occupied at the same time with New Caledonian plants; but the inconvenience of the proceeding is

fully exemplified by the paper being so long unknown to, if not ignored by, Messieurs Brongniart and Gris, who only allude to it in the present year, after having in several cases hit upon identical names for different genera, or published identical genera or species under different names.

Of the *Annales de la Société Linnéenne de Lyon*, four volumes, octavo, with a few plates, at first very indifferent, formed a first series from 1836 to 1852, containing several of Seringe's, and afterwards of Jordan's botanical papers, with improved plates, and a few entomological contributions. A second series, in imperial octavo, was begun in 1852, and carried on, in eight volumes, to 1862. In these are numerous entomological papers, sometimes occupying whole volumes, by E. Mulsant, A. Rey, and G. Levrat, and also several of Jordan's descriptions of so-called new species of French plants.

The Agricultural Society of Lyons professes also to include Natural History in its publications, which consist of three series, large imperial octavo, with very few plates, entitled *Annales des Sciences Physiques et Naturelles, d'Agriculture et d'Industrie, publiées par la Société Royale d'Agriculture, etc. de Lyon*. The first series is in eleven volumes, 1837 to 1848, the word *Nationale* being substituted for *Royale* in the eleventh; the second series, in eight volumes, carries it to 1856, the *Nationale* being again changed to *Impériale* in the third; and the present series, the third, commencing in 1857, has six volumes, the last received dated 1862. Here, as in other Lyons publications, are several long entomological papers by E. Mulsant and his coadjutors; and there is also in the seventh and eighth volumes of the second series a fauna of the Island of Woodlark or Moïou, by the same Father Montrouzier who wrote the *Flora* of the island of Art. The insects at least appear to have been worked up at Sydney, with the assistance of the late Mr. William MacLeay's collections; but although published in France, there appears to have been here no more than in the case of the *Flora* any communication with European naturalists. There are also in these *Annales* a few botanical papers, physiological or even descriptive, but of little or no importance, the great majority being geological or agricultural, and, especially in the later volumes, sericicultural.

The *Académie des Sciences et Lettres de MONTPELLIER*, Section des Sciences, published in 1847 and 1848 two thin quarto pamphlets of papers, including a very few zoological and botanical, by Paul Gervais, F. Duval, and A. Delile.

The Mémoires de la Société d'Histoire Naturelle de STRASBOURG are in five volumes, quarto, with plates, 1830 to 1862, the title being changed in the fifth volume (1858 to 1862) to Mémoires de la Société des Sciences Naturelles de Strasbourg. They contain, besides many geological papers and a few on the local fauna and flora, a few contributions to animal physiology and anatomy by Duvernoy and others, papers on the Giraffe by Joly and Lavocat, on Madagascar zoology by Sganzin, on Algerine testacea by Kuhn, on *Cyprinus barbus* by Buchner, and on a new crab by Lereboullet—and in botany, Lee on Ferns, on the cryptogams of officinal barks, and various histological contributions; Steenheil on Individuality in vegetables, and other speculative subjects; and W. O. Schimper's anatomy and physiology of mosses. Each paper has a separate paging throughout the series.

I have also references to Bulletins, Mémoires, or Annales of Natural-History Societies at AUXERRE (Yonne), COLMAR, GUÉRET (Creuze), METZ (Moselle), PRIVAS (Ardèche), RENNES (Ille-et-Vilaine), LA ROCHELLE, and VERSAILLES (Seine-et-Oise), all of them otherwise unknown to me.

Zoological or botanical papers may also occasionally be found in the Transactions or Proceedings of the Scientific Academies or Societies of AGEN, AMIENS, ANGERS, BAYEUX, BESANÇON, BORDEAUX, BOULOGNE-SUR-MER, CAEN, CHAMBÉRY, CLERMONT-FERRAND, DIJON, EPINAL, LILLE, LE MANS, METZ, NANCY, NANTES, ORLÉANS, PROVINS, RENNES, ROUEN, ST. QUENTIN, TOULOUSE, TROYES, and VALENCIENNES; but as none of them profess to be specially devoted to Natural History, it would have taken up more time than I can bestow to look them over.

XIII. BRITAIN AND KINDRED STATES.

It had been my intention in a similar manner to have passed in review the Transactions and Journals in the English Language which profess to include Natural History among the papers admitted; but time and space have failed me, and this is of the less importance, as they are all so much better known to us than foreign ones. I shall therefore merely enumerate the titles of a few of the most important of them.

In the East Indies the Calcutta Journal of Natural History, octavo, was carried through eight volumes, from 1841 to 1848; and a few papers on Zoology and Botany are dispersed through the more or less voluminous series of the Journal of the Asiatic Society of Bengal, octavo, and their Asiatic Researches, quarto;

the Transactions of the Agricultural and Horticultural Society of India, octavo; the Madras Journal of Literature and Science, octavo; the Journal of the Indian Archipelago and Eastern Asia, octavo; and the Transactions of the Royal Society of Arts and Sciences of the Mauritius, octavo.

From Australia we have the Transactions of the Royal Society of Van Diemen's Land, of the Philosophical Society, afterwards Philosophical Institute, and now Royal Society of Victoria, and of the Entomological Society of Sydney, all in octavo.

From British North America we receive the Transactions of the Nova Scotian Institute of Natural Science, the annals of the Botanical Society of Canada, and the Canadian Naturalist and Geologist, all in octavo.

From the United States my friend Dr. A. Gray has kindly transmitted to me a list of no less than sixty-eight Transactions or Journals, in which more or less of zoology and botany has been published; and of these, thirty-six are still in progress. Very few are exclusively devoted to Natural History; but the Transactions of the principal Scientific Societies of Boston, New York, Philadelphia, and Washington contain numerous most valuable papers, both on American and general Zoology and Botany, interspersed with contributions to other sciences. The most important works of the kind in the Libraries at Burlington House are,—the Memoirs of the American Academy of Arts and Sciences at Boston, in quarto, and their Proceedings, in octavo; the Proceedings and Journal of the Boston Society of Natural History, octavo; the Annals of the Lyceum of Natural History of New York, octavo; the Journal of the Academy of Natural Sciences of Philadelphia, at first in octavo, and now in quarto; the Transactions of the American Philosophical Society at Philadelphia, quarto; the Contributions to Knowledge of the Smithsonian Institution, Washington, quarto; and Silliman's American Journal of Science, octavo. Dr. Gray's list comprises also Transactions still being published by Societies for general Science or for Natural History specially, at Albany, Bloomington (Illinois), Buffalo, California, Charleston, Chicago, New Orleans, Portland (Maine), St. Louis, and Salem (Massachusetts), besides numerous Agricultural Associations.

At home our own Linnean Transactions and Journal, and those of the Zoological and Entomological Societies of London, of the Botanical Society of Edinburgh, and of the Natural History Society of Dublin, are exclusively devoted to Zoology and Botany, besides those of the Wernerian Society of Edinburgh, now ex-

tinct. Papers on our sciences are also dispersed through the voluminous Philosophical Transactions of the Royal Society, as well as through those of the Royal Society of Edinburgh, of the Cambridge Philosophical Society, and of numerous provincial Societies. We have had several Zoological and Botanical Journals, now discontinued, amongst which the most important were the several series of Journals of Botany edited by the late Sir William J. Hooker. The most important now publishing are the *Annals of Natural History*, the *Ibis*, the *Zoologist*, and Seemann's *Journal of Botany*, devoted exclusively to our sciences, besides occasional original papers in the *Natural History Review*, the *Quarterly Journal of Science*, and other periodicals which include general science. And although not strictly a Journal, I may mention incidentally as a proof of the comparative stability of our institutions, that the *Botanical Magazine* has now regularly appeared on the 1st of every month through an unbroken series of eighty-three years—a circumstance I believe wholly unparalleled in the case of any periodical, scientific or literary, on the Continent, where not only have political convulsions frequently disorganized every scientific institution, but where, in the most tranquil times, scientific Transactions and Journals are always falling in arrear of their regular issue.

In reviewing the various modes of publication tried, adopted, abandoned, or resumed by different scientific bodies, we see that the changes made have generally been governed by the desire to reconcile antagonizing rules, each of which has its advantages and inconveniences. Concentration of subjects for patrons and others, who only take a general interest in science or in the Society cultivating it, separation for those who devote themselves to the close investigation of special branches—the bulky quarto, with expensive plates indispensable for the complete illustration of a great number of subjects, or the compact octavo, more suited to the light purses of most naturalists, and more convenient for reference to all—an immediate call on the part of the members and supporters of a scientific body for ephemeral reports of the proceedings of each meeting, and the demands of science in general for a permanent record of the results of their labours, are objects all of which have been aimed at by most publishing associations. When first the inhabitants of a town or district begin to turn their attention from the ordinary business of life to science, lite-

rature, or the arts, the individuals are few, they stand in need of sympathy, encouragement, and support in the pursuit of intellectual occupations. For this purpose they form an Association, and the several members, however different the line of their individual pursuits, have one common object, which all can enter into—the investigation of the resources of their own immediate district. For their own use and that of their fellow-citizens, whom they are anxious to convince that they are not labouring in vain, they commence printing a report of their proceedings, every article of which, at that early stage, may be interesting to all. If the Society succeeds, if it obtains the support of a few active, zealous, and able members, its numbers and influence increase, a desire gains ground of extending the range of its researches, and of rising to a prominent position in the intellectual world. It enters into correspondence with other Societies; emulation induces it to encourage the treatment of general subjects in science, literature, and art; it gladly accepts elaborate papers, not immediately connected with its own locality, and which can only be interesting to those of its members who specially study the questions treated of; and, to give further value to the Transactions, contributions are sought for from the most eminent men in each line, whether forming part of the Association or not. As learning progresses, each individual member must more and more restrict himself to special subjects, and he finds that the publications of the Society have in the mean time so much increased in bulk and variety that his shelves become loaded with matters comparatively or wholly useless to himself. The sale of the Transactions, or the pecuniary support of the Association for the sake of its publications, does not keep pace with that extension of bulk and variety; and moreover, at the Society's meetings, it is found that the greater the details entered into of special branches, the less interest is taken in them by the members at large. Separation of subjects is then resorted to, and there are now but few Institutes, Academies, or other Associations that have risen to any importance in the treatment of general subjects, that have not had supporters enough to divide them into three separate bodies or branches, for Science, Literature, and Art. In the great centres of learning, division of labour has not stopped here. Moral and political sciences have almost universally formed either a distinct section of science, or an independent branch of learning between science and literature. Beyond that, there is much diversity in subdivision, and often much vacillation. Mathematics and Physical Sciences (Astronomy,

Mathematics, Physics, and Chemistry), often associated with Natural History, and still in some Transactions and Journals even included in the general title of *Naturkunde*, *Naturwissenschaften*, or *Sciences Naturelles*, have in other cases been quite separated. Geology is the next to be cut off, and Zoology has parted with Botany; and lastly, independently of the numerous Associations for the practical application of natural science, we have seen separate Societies, with their Transactions, as well as Journals for Ornithology, Ichthyology, Entomology, Palæontology, Histology, &c. Men have thus been encouraged to restrict their observations to very limited classes of beings, and to generalize upon the very inefficient data thus obtained, with the same inconveniences which resulted at the outset from generalizing upon observations made in a limited territorial area. Reaction, and an attempt at reconcentration, have in some cases been the consequence, and it is now a great practical question, which has agitated many academical bodies, and which deserves our own serious consideration, how far we should connect or separate them in our meetings and publications.

I have said that most of the great scientific bodies have by this time more or less completely adopted the separation of Mathematical and Physical Science from Natural History proper, but not all. I have had before me series of from twenty to sixty bulky quartos, in which they are more or less mixed from first to last. Taking the two hundred odd ponderous volumes of Italian, Spanish, and Portuguese Transactions, I do not think that there are, on an average, two Natural-History papers per volume—Art, History, and Literature predominating even over Mathematics and Physics; and at some of our meetings we have seen whole piles without anything to interest us. This amalgamation is often justified on the plea that in the smaller towns, or even in capitals where science is not yet cultivated, the number of members and the material support are not sufficient for issuing separate publications. But in such cases it would surely be for their interest to confine themselves to subjects of local interest which do receive that sufficient support, and that men who rise above these to general science, should send all contributions which ought to come under the notice of distant workers in the same branch, to Societies or Journals generally accessible to their fellow-labourers. It would appear to be a mistaken notion we many of us entertain, that by having our name appear as contributing to as great a variety of publications as possible we really promote our reputation. An

algebraical memoir between two zoological or botanical monographs does its author no more credit than a technical botanical description of new genera in a Journal of fashion. In either case the paper is absolutely lost till ferreted out by some industrious compiler; and then it is sure to produce confusion as to dates and rights of priority. Innumerable instances of a similar kind will probably be brought to light by the Royal Society's forthcoming indexes.

The same arguments apply, only with less force, to the separation of Geology and Mineralogy from Biology*; but when we come to the multiplied subdivisions of Zoology and Botany, we are met by drawbacks which are beginning to be much felt. For the distinction and classification of species, for the accurate observation of individual structure, for the collecting, in short, of those data upon which the superstructure of science must be founded, we require that men of the greatest ability should devote themselves especially, we will not say exclusively, to special classes of beings; but those higher branches of the science which are now attracting so much attention, the study of the phenomena of life, require a general knowledge of, or reference to, all classes. There is, with great individual diversity, so much general analogy in the principles of life in all the most dissimilar sets of beings, so much of mutual dependence of the one on the other, that in a science where the facts upon which we form an hypothesis are so few—the circumstantial evidence on which we found our judgments so scanty—we require in every branch to check our conclusions by what has been observed in others. Whilst therefore there is much practical use in such typographical arrangements as to enable every votary of science to furnish his shelves with what answers his special pursuit alone, it is no less essential that all discussion of general principles, whether in print or oral, should be readily brought to the notice of all.

The principle of the mutual bearing of different sciences pre-

* In reading this address to the Meeting, I made use of the term Biology in the restricted sense which, after the example of many writers, I had given to it in my addresses of 1862 and 1863, and I ventured to give further currency to the word Biontology alluded to in 1863. Now, however, as the extension of Biology to Zoology and Botany together in their widest sense has been further sanctioned by the British Association, who have given that name to their Section D, I feel compelled to follow their example. In matters of language, the purport of which is to make one's self intelligible, theory must give way to custom.

serves the unity of the leading scientific Body of each one of the European states, to which Body, if its number be limited, every one who devotes himself to science in any branch hopes one day to be admitted. In every State this Body has included, and does include, in its deliberations and transactions, all sciences; in many of them divisions or other arrangements have been adopted for the separate issue of divisions of science, or of isolated memoirs to supply the separate wants of individual members; but then a difficulty has occurred with regard to the reports of what takes place at each meeting which every member desires to receive. This has given rise to the publication of Minutes of Meetings, entitled Reports, Bulletins, Comptes Rendus, Rendiconti, Monats- or Jahresberichte, Oversigt, Öfversigt, &c. of Proceedings, or, as we say for shortness, Proceedings. In the early stages of each Association these Proceedings are generally prefixed to the Memoirs. The latter are, however, in quarto; the preparation of the illustrations takes time, and the parts are published often one or two years after the papers were read, when the minutes of the meetings have lost their ephemeral interest. A separate publication of Proceedings, in a more convenient form, at shorter intervals, has therefore of late years been generally adopted. As these Proceedings are sufficient to fix dates and establish priority of observations and names, it has been found satisfactory to contributors to include abstracts of their papers. To these have been gradually added short papers *in extenso*; and, no absolute definition of shortness being adopted, and the octavo being found the most convenient form for many memoirs, especially synoptical monographs, faunas and floras, many of these Proceedings have grown into Transactions, differing from the quarto ones only in form and frequency of issue, the original object of a distinct publication of ephemeral minutes of meetings not required for permanent reference being lost sight of: consequently a further modification has in some cases been adopted, a threefold publication, first, of quarto Transactions for important papers requiring costly illustrations, or which their authors prefer to see in that form; secondly, of an octavo Journal for papers equally permanent, but for reference to which the smaller form is more convenient; and thirdly, of separate or separable Minutes or Reports of Proceedings. Most bodies, however, limit themselves to the double publication of quarto Transactions, and Proceedings either in octavo or, in the case of the Russian and some Italian and German Academies, in quarto like the Transactions.

With regard to the Transactions themselves, various devices have been resorted to, by which those of the Members who consider themselves as patrons or general cultivators of science could exhibit the whole on their tables and shelves as one complete work, whilst the labourers in science might select separate portions without the appearance of being fragments only. Separate volumes, series, parts of volumes, &c. have been devoted to the principal branches; or, again, every separate paper, however short, has its separate title and paging, although stitched up into volumes, with a general title; or a certain number of copies of each paper are printed off with a separate title and paging for the separate sale. In some continental Transactions the separate paging of short papers is carried to such a degree as to entail all the inconveniences of a series of detached pamphlets. The double paging of the separate and continuous copies, on the other hand, produces much confusion in quoting references. The most convenient course pointed out by experience, seems to be that, in quarto Transactions including a diversity of subjects, the papers should be separable, but that each should bear an indication of the Transactions and volume from which it is taken, retaining at the same time the original paging in all separate issues, whether of authors' copies or for sale. We have long printed our own Transactions in such a manner as that the volumes can be broken up into separate memoirs; and the Council has now determined that authors' and other copies should retain the original paging. The Council have also taken into consideration the means of allowing a separate sale of individual papers. The only difficulty appears to be the very unequal demand there would be for them, thus leaving on our hands a large stock of broken sets.

A much more important question for our serious consideration is, how we are to retain our position or extend our influence as a Linnean Society for the cultivation of all branches of Biology, to maintain the unity of the science for all general discussions, and at the same time to promote accuracy by the encouragement of the closest study of the minutest details. Some five and thirty years since, a general feeling amongst the younger scientific men, that the old Societies established in previous generations were not keeping pace with the progressive changes of the day, induced the establishment of a number of separate Associations, either as supplementary or in opposition to the old ones, whilst in the latter the majority of the managers, often from a conservative feeling, stimulated by the political discussions of the day, did not see the

danger to themselves in resisting amendments. The Linnean Society in past times, I may be allowed to admit (as I was myself at the time for several years a member of the Council and a constant attendant at its deliberations), looked on with indifference whilst Zoological, Botanical, Ornithological, Entomological, and other Societies were set up under various pretexts to carry off its active or discontented members; and we seemed to be falling asleep with the additional incubus of the heavy debt incurred by the purchase of the Linnean Herbarium, zoological collections, and library. That time is now fortunately over. Under the conciliatory influence and able management of my predecessor in this chair, one of our present Vice-Presidents, on entering the Council, succeeded in stirring up the energies of the Society by a thorough reform in its proceedings. The result is a constantly increasing prosperity, which it behoves us to apply to the promotion of the highest objects of our Association. We are proud to reckon amongst our fellows all that is most eminent in the country in Zoology as well as in Botany. The valuable, rare, and costly works of our large library, as well as those of more daily practical use, are very fairly divided between the two branches; all our efforts have been directed to the promotion of both; the chair I now occupy has been alternately filled by the special votaries of each. It has been, and should be, our ambition to establish ourselves firmly as the great centre for all biological science, whence the various branches should radiate. But for this there are great practical difficulties to be overcome. Mere opposition Associations have died a natural death, and entomologists have such inexhaustible numbers of individual objects to work up in detail, as to give occupation enough for a distinct Society without interfering with us; but the extraordinary prosperity of the Zoological Society under its present active management threatens to withdraw from us much of zoological matter that our botanical members would be anxious to partake in.

The Zoological, or as it soon became, the Entomological Club of the Linnean Society, was first separated from us as a distinct Zoological Society with a view chiefly to establish and maintain a collection of living animals, which could not come within our proper attributes; and had we then been active we might have retained our connexion so as to secure the scientific business, in correspondence with but apart from the more special objects of the new establishment. As it is, the Zoological Society have gradually provided themselves with immense resources; they have meetings for

scientific business apart from their general meetings, active promoters of their scientific proceedings, and ample support for their publications, as well as general members attracted by their splendid gardens ; and some of them may have hinted that the Linnean Society may be left to botanists ; but I am happy to say that several of their leading men have agreed with me that the Linnean ought to maintain its position at the head of both branches, and that a closer connexion between the scientific branch of the Zoological and the Linnean might yet be reestablished. I foresee great practical difficulties in the details of any plan that has been thought of, but not, I think, insurmountable ones ; and the object appears to me so desirable for the interests of both Societies, and for the general promotion of Science, that I should be most anxious to receive and consider any suggestions which might occur to you on the subject. In the mean time I would strongly impress upon those zoologists who treat of geographical distribution, biological history, metamorphosis, and development, and other general questions, as well as the investigators of those lower orders of animals which are either closely connected with or dependent on vegetable life, or cannot form part of the Regent's Park Menagerie, the advantage of sending their communications to us in preference to Societies of more restricted range.

To Geology proper we have long given up all pretensions ; but in the present day, when many a link between former races of beings and those now living has been established, palæontology is becoming more and more connected with actual biology, and we ought perhaps to encourage the production of papers on the subject at our Meetings.

Our Ethnological Societies appear now to be at the zenith of their prosperity, and take a very wide range for their discussions. If any reaction should hereafter take place, and they return to their more legitimate subjects, it will be found perhaps that some of those they have treated would more naturally come under animal biology.

There is another Society to whom we are much indebted for encouragement and cooperation, our own parent, the Royal Society, the acknowledged head of all science in the country. Our connexion with them has, I am happy to say, been drawn much closer since we have been admitted under the same roof. It has occurred to some members of both bodies that advantages might accrue to both by some still closer connexion as to the publication of papers on the higher questions of Natural History.

As yet no practical plan has been proposed; but suggestions have been made which, if matured, will, I have no doubt, be considered by the President and Council of the Royal Society in that liberal spirit which they have ever evinced towards us.

In conclusion, Gentlemen, I have to beg you to excuse my having thus alluded to these various difficulties and suggestions, my object being to show how deeply I feel the obligation imposed upon us to maintain our position at the head of Biological Science, and the necessity of constant vigilance and activity to secure that end, and to assure you how anxious I am to perform my part, which is but very little without the cordial cooperation of you all.

Additional Notes.

The Copenhagen Videnskabelige Meddelelser, mentioned above, p. xiv., are complete in Dr. Sclater's library. They relate exclusively to Zoology and Botany. The last volume received is that for 1863, dated 1864.

At Naples, an *Annuario del Museo Zoologico della R. Università di Napoli* is published under the editorship of Achille Coste in thin annual parts, large octavo, with a few plates. The second, for 1862, but dated 1864, is the last received.

At Palermo, a *Giornale di Scienze Naturali ed Economiche*, pubblicato per cura del consiglio di perfezionamento annesso al R. Istituto tecnico di Palermo, has commenced, in quarto, with plates. The two parts received, both dated in the present year, contain, amidst a variety of subjects, a paper on fossil *Nerineæ* by Gemmellaro, and one on some new Fungi by Inzenga.

A *Bulletin de la Société Ornithologique Suisse*, in very large octavo, with plates, has just been commenced at Geneva.

OBITUARY NOTICES.

The Secretary then read the following Notices of deceased *Members*:—

The Venerable Archdeacon Charles Parr Burney, D.D., F.R.S., F.G.S., &c., was born at Chiswick, on the 19th of October, 1785.

Descended from a family distinguished for several generations on both the male and female sides by literary and other attainments, the late Dr. Burney fully maintained the honour of his name. Under the immediate tuition of his father, the celebrated classical scholar, and doubtless with a view to the scholastic profession himself, Dr. Burney's attention, as was to be expected, was principally devoted to classical and mathematical studies, in which he became distinguished at an early age. His university career was passed at Merton College, Oxford; at its conclusion he joined his father in the direction of the large and excellent school for which Greenwich was so long and so eminently distinguished, and to the entire management of which Dr. Burney succeeded on the death of his father.

On receiving a presentation to the living of Sible Hedingham, in Essex, Dr. Burney relinquished the academical profession, and devoted himself, with his characteristic conscientiousness, to the duties of a parish priest. Shortly afterwards he was appointed Archdeacon of St. Alban's, and in 1845 was nominated to the same office in Colchester.

Though never, so far as I am aware, a contributor himself to natural science, Dr. Burney was throughout his life distinguished by his attachment to it. He delighted in the conversation of scientific men, and at one time was a not unfrequent attendant at the meetings of this and of other societies, especially the Geological and Zoological, of which latter he was one of the original members. He became a Fellow of this Society on the 21st of January, 1823; and died at Brighton, on the 1st of December, 1864.

Samuel Cartwright, Esq., F.R.S., F.G.S., &c., was born at Northampton, in the year 1789, and died at Tunbridge, on the 10th of June, 1864, having been a Fellow of this Society since the 19th of November, 1833.

Although a member of nearly every scientific society in London, Mr. Cartwright was not, so far as I am aware, a contributor to the 'Proceedings' of any. He was, nevertheless, a man of considerable mark, and in his own profession—that of a dentist—perhaps in his time unrivalled.

He came to London at an early age, dependent wholly upon his own exertions for his daily support, and commenced life as mechanical assistant to Mr. Dumergue, who was at that time in extensive practice as a dentist among the fashionable population of the West End. During this service, in which he worked assiduously and conscientiously, Mr. Cartwright yet found time to improve himself in general professional knowledge by a regular attendance on anatomical and surgical lectures.

In 1811, having thus fully qualified himself, not only in the mechanical but also in the more scientific departments of dentistry, he started in practice on his own account, and soon, as most present perhaps are aware, acquired a reputation second to that of none, either before or since, who have practised the same branch of the healing art.

He was as remarkable for the rapidity and correctness of his judgment as he was for marvellous dexterity in all manipulatory processes; and the energy with which he discharged his professional duties may be estimated when it is stated that during a great part of his career he was in the habit of seeing from forty to fifty patients every day, and this for months together, standing constantly from seven o'clock in the morning until the same hour in the evening, and yet in every case doing what he had to do without the slightest appearance of hurry or fatigue.

Mr. Cartwright's pleasing manners, liberal hospitality, and professional fame acquired for him the friendship of nearly all the men most distinguished in science, literature, and art of his day. He retired from the labours of practice in 1857, and in the following year had an apoplectic seizure which resulted in palsy, under which he laboured for the rest of his life.

Henry Christy, Esq., F.G.S., was the eldest surviving son of the late William Miller Christy, of Woodbines, Kingston-on-Thames. His elder brother, who died some years since, was well known in this Society as an ardent and accomplished botanist.

Henry Christy from his youth had displayed, in common with his brother, a great love for natural science, and especially for geology and botany; but the earlier years of his life, when arrived at man's estate, were devoted to the conducting and improvement of his father's manufactory at Stockport in Lancashire. He retired from business, however, many years since, and, with ample means, dedicated himself to the pursuit and encouragement of art and science.

Not from idleness or the love of ease did Mr. Christy thus relinquish an extensive and lucrative business, but simply, as it

would seem, to afford himself unshackled leisure to follow his favourite pursuits, and, generally speaking, to devote his time and ample means to the advancement of science in any direction where he perceived an opportunity of being useful. One of the branches of knowledge which appears at this time to have more especially attracted his attention was what may be termed that of ethnological archæology. He was particularly interested in the primitive arts and customs of the semicivilized and savage races of mankind; and with a view of collecting materials and observations relating to these subjects, as well as of increasing his natural-history knowledge, Mr. Christy undertook numerous and extensive voyages and travels. One of the most important of these earlier labours was the exploration, in company with his friend Mr. Edward B. Tylor, the accomplished author of 'Researches into the Early History of Mankind,' of nearly all parts of Mexico and other places in the West Indies. The results of this voyage, the publication of which, as I understand, owes much to Mr. Christy's liberality, were made known by his coadjutor in 1861 under the title of 'Anahuac,' a work full of the most curious archæological and other information conveyed in a pleasing and attractive style.

Mr. Christy had also at different times visited all parts of the United States and, in fact it may be said, of the continent of North America in its temperate zone, from the shores of the Atlantic to those of the Pacific Ocean, visiting Canada and the colony of British Columbia, &c.

His indefatigable zeal and enlightened curiosity in like manner carried him to nearly every part of Europe, from the Scandinavian kingdoms of the north to the extremity of Southern Spain. He had also travelled in the East, and had visited many parts of the north of Africa, in Algeria and, I believe, Morocco, stretching his explorations to the slopes of the Atlas and the borders of the Great Desert, whence he brought numerous and curious relics of primitive human art.

In all these extensive peregrinations Mr. Christy was far more than an ordinary tourist. Wherever he went, he went with a definite object, which he followed out with indomitable industry, and in the furtherance of which he spared neither personal exertion, time, nor money. As connected with his favourite subject, Mr. Christy was, when in Denmark, much interested in the unrivalled collection contained in the Museum of Northern Antiquities, which has been brought together and is supported by the liberality of the Danish Government seconded by the en-

lightened cooperation of the well-educated and intelligent Danish people of all ranks, and which is under the direction of the eminent scientific men who have added such lustre to the Scandinavian name.

In the prosecution of his researches Mr. Christy was necessarily thrown into close relations with numerous scientific men in all parts of the world, none of whom will ever cease to cherish the remembrance of the well-considered and liberally tendered aid always readily afforded by our lamented friend. Nor will those among them who were fortunate enough to experience it ever forget the genial hospitality and kindly manner with which they were invariably welcomed in this country by Mr. Christy.

Of late years Mr. Christy's attention had been more particularly directed to those branches of archæological inquiry which relate to the subject which at the present day, in one way or another, occupies perhaps more widely than any other the interest and attention of both the learned and the unlearned, and which, in fact, more than any other, offers problems of the highest importance in almost every branch of human knowledge; for it would be difficult to name any department of science which might not be invoked to throw light upon the vast questions relating to the origin and primitive relations of the human race.

To this great and important question Mr. Christy devoted the last years of his life, and, in fact, it may with truth be said, his life itself; and few will be found who have contributed more valuable materials for its future elucidation.

In intimate association with his friend M. Lartêt, one of the most distinguished, if not the most distinguished and accomplished, of existing Mammalian palæontologists, and equally versed in priscan archæology, whose successful explorations at Aurignac and other places in the south of France are so well known, Mr. Christy determined to follow out similar researches in other promising localities in the same or adjoining districts of the country. The points selected were principally on the banks of the Vezère, in the Dordogne, as at Les Eyzies, Laugerie, &c.

These explorations, which have been uninterruptedly pursued up to the present time solely, I believe, at Mr. Christy's expense, and for the most part under the personal inspection of himself and his friend M. Lartêt, have necessarily involved a very considerable outlay of money and great sacrifice of time and labour—all given ungrudgingly and most unselfishly by Mr. Christy. In all this work and in all these sacrifices he was animated by no

feeling of a personal kind, but solely by a desire of benefiting science, and of adding all he could to the materials for the future solution of the great and absorbing question of the day.

The rich materials thus abundantly collected by the exertions of MM. Christy and Lartêt were not reserved for their own special use or glorification, but were as widely distributed and as liberally afforded to all engaged on the subject to which they belonged as they were industriously collected. The choicest specimens, as was but right, having been selected to form a principal public collection in France, out of the remainder numerous well-selected sets were made up, and have been distributed, at Mr. Christy's expense, to nearly every public museum in this country and abroad, where they would be valued and useful, as well as to numerous private individuals known to be interested in the subject. Such an instance of the purest and most disinterested liberality in the cause of science is, I think, almost unexampled, and well deserves to be kept in honoured remembrance. The copious and unrivalled results of the conjoined labours of Mr. Christy and his friend were intended to be embodied in a work of great extent, under the title of '*Reliquiæ Aquitanicæ*,' of which numerous plates have already been prepared, and which it is to be earnestly hoped—and there is, I am glad to learn, every reason to believe—M. Lartêt will be able still to carry to completion. When completed, it will be one of the most important contributions to the early history of mankind (at the extraordinary epoch when the Reindeer was the most abundant mammal in the south of France) it is possible to conceive.

Mr. Christy's liberality to various public collections was not confined to the above instance. He was constantly in the habit of presenting most valuable and costly specimens to the British Museum and to the Hunterian Museum of the Royal College of Surgeons, which is indebted to him for several donations of great value, amongst which, as particularly interesting to this Society, I would mention a most perfect and beautifully prepared skeleton of the West-Indian Manatee, which had been procured and set up by Mr. Christy at a very considerable expense.

But this brief and imperfect notice of the life and character of Mr. Christy cannot be concluded without my stating that his claims to our regard, and, in fact, to the regard of all men, are not based simply upon his exertions and his liberality in the cause of science. His liberality was universal: wherever he perceived a worthy object, his hand was open as the day; but of the extent to

which his benevolence was carried none perhaps but himself and its recipients, and not always they, were aware; he was truly one of those who love to do good by stealth. But on more than one public occasion the warmth of his charity and the liberality of his soul, and at the same time the soundness of his judgment in the distribution of his aid and the application of his time, could not be concealed. At the time of the Irish famine Mr. Christy was conspicuous for his personal devotion to the examination of the state of the people on the spot, and for the liberality with which he came forward, not only with his money, but with his time and exertions, to the relief of their distress. In this cause, indeed, he was nearly falling a victim to his benevolence.

On the occasion also of the late iniquitous Danish war, in which a gallant people were overwhelmed, notwithstanding the display of the most indomitable resolution and courage, in an unequal struggle with unscrupulous foes, Mr. Christy's sympathies were deeply roused, and he gave considerable sums towards the fund that was raised in this country for the relief of the wounded heroes of the Danish army.

As might be expected from his varied and extensive travels, and from the liberal way in which he carried out any object he had in view, Mr. Christy had collected a most extensive and invaluable museum of articles relating to ethnology and the arts of savage or of primitive human life, and which is especially rich in implements and weapons of stone and bronze from all parts of the world and of all periods, many of which are unique. I am glad to be able to announce that in his will Mr. Christy, not unmindful that he might be useful to science after death, has provided for the due maintenance or proper disposition of his dearly prized collection—entrusting its disposal, as I am given to understand, to some of his friends on whose judgment he could safely rely, and who will doubtless carry out his wishes in the best possible manner for the advancement of science and the perpetuation of the name of Henry Christy.

One circumstance remains to be mentioned in honour of our departed friend. On the last occasion of the selection of candidates for the honour of the Fellowship of the Royal Society, Mr. Christy was one of those chosen—an honour which he had so well earned, and which he so deeply prized, but which, alas! he was not spared to enjoy.

Mr. Christy may be said to have died, as he had lived, in the cause of science. Naturally of a delicate constitution, he was yet

negligent of himself when he had an object before him. During the last spring he had suffered a good deal from a bad cough; but notwithstanding this, on the occasion of a late visit by several of his friends to the ossiferous caves in the Valley of the Meuse and Lesse in Belgium, he joined the company at Liège, suffering at the time a good deal from cough and general weakness. On quitting this party at Dinant, on the 20th of April, he proceeded to Paris to join M. Lartêt in a journey to Switzerland. Before they set out, however, M. Lartêt, who had noticed a great alteration in his voice, and was alarmed at the violence of his cough, persuaded him to take medical advice; but this it appears was unavailable to prevent his continuing the projected journey, the object of which was the comparison on the spot, by himself and M. Lartêt, of the animal remains from the Dordogne with those collected from the pile-dwellings of Switzerland. He accordingly set out with his attached friends M. and Madame Lartêt. Arriving the following day at La Palisse, he exposed himself a good deal to heat and fatigue in an excursion in the neighbourhood of that town, and in the evening was compelled to take to his bed, whence he never rose again, and where, in spite of the most attentive kindness and the ablest medical advice, and after several fluctuations of hope and despair in those who watched him, he died, on the 4th of May, in the fifty-fifth year of his age. His calmness and resignation in the immediate prospect of death, and the kind and considerate manner in which he expressed himself towards his friends and with respect to the objects to which he had devoted his blameless life, appear to have been truly remarkable, and to show more clearly than anything else his true character as a most excellent and wholly unselfish man.

Hugh Falconer, M.D., Vice-Pres. R.S., For. Sec. G.S., &c., was born at Forres, in the north of Scotland, on the 29th February, 1808. His early education was conducted at the Grammar School of Forres; and he afterwards studied arts for four years at King's College, Aberdeen, and medicine for an equal period in the University of Edinburgh.

As a boy he exhibited a decided taste for the study of natural history, which he eagerly followed up in Edinburgh under Professors Graham and Jameson. When duly qualified, he was nominated to the appointment of Assistant-Surgeon on the Bengal Establishment; but, not having attained the required age of twenty-two, he indulged the natural bent of his mind in the compulsory interval in assisting the late Dr. N. Wallich in the distribution of

his great Indian herbarium, and in the study of geology and palæontology. In the latter subject the Museum of the Geological Society of London, at that time under the charge of Mr. Lonsdale, afforded him ample materials, amongst which, as bearing more especially upon his future inquiries, was the collection of Indian fossil Mammalia from the banks of the Irawaddi, formed by Mr. John Crawford during his mission to Ava, and the description of which by Mr. Clift had excited much interest in the scientific world, as the first instance in which ground had been broken in the palæontology of tropical regions. The influence of his study of these remains was manifested immediately on his arrival in Calcutta in September 1830, when he undertook the examination of a collection of fossil bones from Ava in the possession of the Asiatic Society of Bengal, and upon which he communicated a short paper in the third volume of the 'Gleanings of Science.' This notice, though slight and modest in its scope, nevertheless at once placed Dr. Falconer in a recognized position on the then scanty roll of cultivators of science in India. Early in 1831 Dr. Falconer, being ordered to the station of Meerut, performed his first and last military duty during twenty-six years of service. This consisted of his taking charge of a detachment of invalids proceeding to the Sanatorium of Landour in the Himalayas. Fortunately for science and perhaps for himself, his route passed through Suharanpoor, where the late Dr. Royle was then Superintendent of the Botanic Garden. Kindred tastes and common pursuits soon knit Falconer and Royle together; and at the instance of his friend, Falconer was appointed to officiate for him during a leave of absence, and in the following year Dr. Falconer succeeded him altogether in the charge of the Garden. Thus at the early age of twenty-three was he advanced to a responsible and independent public post, offering to the naturalist the most enviable opportunities for research; and thus in his case was afforded a striking instance of the advantages the Indian service, at that time and still, occasionally holds out to those among its junior medical officers who may display a special aptitude for the discharge of scientific functions independent of their profession. Suharanpoor is situated between the Jumna and the Ganges, distant about twenty-five miles from the Sewalik Hills, and close upon the confines of the Tarai or belt of forest lying between the mountains and the plain. From the variety of soil, climate, and productions afforded in such a situation, Suharanpoor is thus most favourably placed as a central station for natural-history investigations; but being a remote (more

then, perhaps, than now) provincial station, with very few European residents, these had to draw on local means alone in all emergencies where the appliances of civilized life were required. This was also the only source to which Dr. Falconer could look for such scientific appliances as his inquiries demanded; and in the utilization of the intelligence, docility, and manual dexterity of the natives his zeal and energy enabled him to effect more than might have been deemed possible.

To construct a mountain-barometer, for instance, broken tumblers were melted and made into a tube, whilst the mercury was distilled from cinnabar purchased in the bazaar; a reservoir was turned out of boxwood felled on the mountain; and, lastly, a brass scale was cast, shaped, and graduated by a native blacksmith under the superintending eye of the master. Such discipline was of infinite value in training the young officer to habits of self-reliance, and in establishing kindly relations with those around him, and no doubt contributed greatly to the fund of universal information for which Dr. Falconer was afterwards so remarkable.

Thus favourably situated and prepared as he was by previous training and special study, it was not long before Dr. Falconer's well-directed observations were duly rewarded by important discoveries in his favourite subject of palæontology. In 1832 he commenced an exploration of the subhimalayan range, and, led by the indications afforded by a specimen in the collection of his friend and colleague, Capt. (now Sir Proby T.) Cautley, he discovered vertebrate fossil remains *in situ* in the tertiary strata of the Sewalik Hills, as recorded in a brief communication to the 'Journal of the Asiatic Society of Bengal' for 1832. The search was speedily followed up by Capt. Cautley in the Kolowala Pass, and resulted in the discovery of more perfect remains, including those of several Miocene Mammalian genera. Early in 1834 Dr. Falconer gave a brief account of the Sewalik Hills, describing their physical features and geological structure, with the first published section, showing their relation to the Himalayas. The name "Sewalik," which had previously been rather vaguely applied, was restricted by Dr. Falconer to the flanking tertiary range separated from the Himalayas by valleys or "doons;" and the term thus restricted, though at first unfavourably received, is now universally adopted. The "tertiary" age of the Sewalik Hills was now also for the first time pointed out, in opposition to the notion that they belonged to the New Red Sandstone, to which they had previously been referred.

The researches thus begun were followed about the end of 1834 by the discovery by Lieutenants Baker and Durand of the great ossiferous deposit of the Sewaliks, near the valley of Markunda. Cautley and Falconer were immediately in the field; and by the joint labours of these four officers a subtropical Mammalian fossil fauna was brought to light, unexampled for richness and extent. It included the earliest-discovered *Quadruman*a, numerous new forms of Proboscidea, extinct species of *Rhinoceros*, *Chalicotherium*, *Equus*, and *Hipparion*, *Hexaprotodon*, *Hippopotamus* and *Merycopotamus*, *Sus*, and *Hippohys*, the gigantic *Sivatherium*, several species of Camel, Giraffe, and new types of *Bovidae*, &c., &c., also numerous fossil bones of birds and reptiles, amongst which was the enormous *Colossochelys Atlas*, &c. Thrown suddenly upon such rich materials, the ordinary aids in their determination by comparison were wholly wanting to the discoverers. But Falconer was not the man to be baffled by such discouragements. He appealed at once to the living forms around him to supply the information he required; and this was made available by him and his indefatigable coadjutor in the preparation of a series of memoirs descriptive of the more remarkable of the newly discovered forms, which appeared in the volumes of the 'Asiatic Researches,' the 'Journal of the Asiatic Society of Bengal,' and in the 'Geological Transactions.' The Sewalik explorations soon attracted the notice of European palæontologists and geologists, and in 1837 the Wollaston Medal in duplicate was deservedly awarded to Dr. Falconer and Captain Cautley. At the same time the duties of his office as Superintendent of the Botanic Garden were not neglected. In 1834 a commission was appointed by the Bengal Government to inquire into and report upon the fitness of India for the growth of the tea-plant. Acting on the information and advice supplied by Dr. Falconer*, the commission recommended a trial. The recommendation was carried out by the establishment of experimental nurseries, which were placed under Dr. Falconer's superintendence, and in sites selected by him.

In 1837 Dr. Falconer was ordered to accompany Burnes's second mission to Caubul, which preceded the Affghan war. In the prosecution of this mission, he proceeded at first westward to Kohat and the lower part of the valley of Bungleish; and afterwards, in company with Lieutenant Mackeson, he journeyed to Cashmere,

* Journ. As. Soc. Beng. 1834, iii. p. 182.

where he passed the winter and spring examining the natural history of the valley. The following summer (1838) he crossed the mountains to Iskardo in Bulkistan, and, by the aid of Rajah Ahmed Shah, traced the Shiggar branch of the Indus to its source in the glacier on the southern flank of the Mooztagh range, 28,000 feet above the level of the sea. After examining the great glaciers of Arindoh and of the Brahldoh valley, he returned to India *viâ* Cashmere and the Punjaub, towards the close of 1838, to resume his duties at Suharanpoor. Of this interesting tour he has left copious notes, which it is to be hoped may some day be published; but those who enjoyed his intimacy will long remember the animated and interesting way in which he occasionally related some of the strange and curious incidents which befell him and his companions in the course of it. One very striking anecdote occurs to my recollection, according to which the safety of himself and his company were on one occasion secured by the favour he won from a chief by the exhibition of the wonders displayed in a drop of water by the microscope, and the politic presentation of the wonder-working instrument to the admiring chief.

In 1840 Dr. Falconer's health, shattered by numerous attacks of illness, completely gave way, and in 1842 he was compelled to seek for a chance of recovery in Europe. He returned to England, bringing with him the natural-history collections amassed during his residence in India and on his extensive journeyings. These amounted to eighty cases of dried plants and about fifty large cases of fossil bones, together with geological specimens illustrative of the Himalayan formations from the Indus to the Gogra, and from the plains of the Punjaub across the mountains north to the Mooztagh range.

Soon after his return to England Dr. Falconer devoted himself almost entirely to the arrangement and examination of the Sewalik fossils. The vast collection made by Captain Cautley, filling 214 large chests, had been presented to the British Museum; and the selected collection belonging to Dr. Falconer himself was divided between that institution and the India House. The labour of superintending the preparation, and of describing and arranging this enormous mass of materials, devolving upon Dr. Falconer, he devoted himself with characteristic zeal to the gigantic task. Rooms for the purpose were assigned to him at the British Museum, whilst the Court of Directors liberally employed him on duty on the footing of service in India; and at his instance they prepared a series of casts of the most remarkable fossils, which

were presented to the principal Museums in Europe. The chief results of the labours thus undertaken are exhibited in the Palæontological Galleries of the British Museum, to which may well be applied, with respect to Falconer, the words inscribed to the memory of Wren in St. Paul's Cathedral. Under the patronage of the Government and of the India House an illustrated work was also commenced, entitled "*Fauna Antiqua Sivalensis*," of which the plates of nine parts were brought out between 1844 and 1847. It is deeply to be deplored that the letterpress descriptive of these beautiful figures, for the most part exquisitely drawn by Ford under the continual and minute superintendence of Dr. Falconer, should never have been completed; but before this could be accomplished the expiration of his leave, in 1847, compelled the return of the author to India, and thus interrupted the progress of a work which, had it been completed according to the original design, would have been one of the most splendid contributions to palæontological science ever produced.

His botanical collections were less fortunate. Having partially suffered from damp on the voyage to England, they were deposited in the cellars of the India House during his second absence in India, where the specimens underwent a ruinous process of decay. A few only were rescued from absolute destruction when Dr. J. D. Hooker succeeded, in 1857, in an application to the authorities at the India House for the removal of these and other botanical collections to Kew.

During his brief residence at this time in England, Dr. Falconer contributed to the Royal Asiatic Society a "*Discourse on the Fossil Fauna of the Sewalik Hills*" (Journ. R. A. Soc. 1844), to the Zoological Society a description of the "*Gigantic Fossil Tortoise, Colossochelys Atlas*," discovered by himself and Capt. Cautley (Proc. Zool. Soc. 1844, p. 85), and to the Geological Society Memoirs "*On Fossil Remains of Anoplotherium and Giraffe, from the Sewalik Hills*" (Proc. Geol. Soc. 1844, vol. iv. p. 235), and on "*Dinotherium, Giraffe, and other Mammalia from the Gulf of Cambay*" (Quart. Journ. Geol. Soc. 1845, vol. i. p. 356); to the Linnean Society he communicated papers on the Asclepiad affinities of *Cryptolepis*, on *Aucklandia Costus*, the Cashmere plant which yields the *Kostos* of the ancients, then for the first time determined—and on *Narthex Asafœtida*, being the first determination also of the plant, long contested among botanists, which yields the asafœtida of commerce. He had found it growing wild in the valley of the Astore, one of the affluents of the Indus. To

the same Society he contributed in 1847 a paper on "*Athalamia*, a new genus of *Marchantieæ*" (Linn. Trans. vol. xx. p. 397).

In 1848, on the retirement of the late Dr. Wallich, Dr. Falconer was appointed his successor as Superintendent of the Calcutta Botanic Garden, and Professor of Botany in the Medical College. In 1850 he was deputed to the Tenasserim Provinces to examine the Teak-forests, which were threatened with exhaustion from reckless felling and neglected conservation. His report, suggesting remedial measures, was published in 1850 in the 'Selections from the Records of the Bengal Government.' In 1852 he communicated a paper on the quinine-yielding *Cinchonas* and their introduction into India (Journ. Agr. Hort. Soc. of India, vol. viii. p. 13); and in the same year the writer of the sketch (Dr. Murchison), from which this account is chiefly drawn, saw, in the Calcutta Botanic Garden, a Wardian case containing specimens of *Cinchona calisaya*, in which Falconer took great interest. Dr. Falconer was not at the time cognizant of Weddell's accurate determination of the species; but he recommended a trial, and indicated the hilly regions in Bengal and the Neilgherries in Southern India as the most promising situations for experimental nurseries. The subject was taken up independently of this recommendation some years afterwards; the bark-yielding *Cinchonas* were then introduced from South America, and are now thriving in India. In 1854, assisted by his friend the late Mr. Henry Walker, he undertook a 'Descriptive Catalogue of the Fossil Collections in the Museum of the Asiatic Society of Bengal,' which was published as a distinct work in 1859. In the spring of 1855 he retired from the Indian service, and on his return home visited the Holy Land, whence he proceeded along the Syrian coast to Smyrna, Constantinople, and the Crimea during the siege of Sebastopol.

Soon after his arrival in England he resumed his palæontological researches, and in 1857 communicated to the Geological Society two memoirs "On the Species of Mastodon and Elephant occurring in the Fossil State in England" (Quart. Journ. Geol. Soc. vol. xiii. p. 308). Besides attempting to discriminate with precision the three British fossil elephants till then confounded under the name of *Elephas primigenius*, Dr. Falconer produced for the first time a synoptical table, showing the serial affinities of all the species of the Proboscidea, fossil and living, then known, of the former of which a large number were either discovered or determined by him. The same year he gave an account of the re-

markable Purbeck mammalian genus "*Plagiaulax*," discovered by Mr. Beckles near Swanage (*op. cit.* vol. xiii. p. 261); this was followed in 1862 by a second paper on the same subject (*op. cit.* vol. xviii. p. 348). Having occupied himself during several years with the special investigation of the mammalian fauna of the pliocene as distinguished from that of the quaternary period of Europe, he was conducted to the examination of the cave-fauna of England. In 1860 he communicated a memoir on the numerous ossiferous caves of Gower, explored or discovered by his friend Lieutenant-Colonel Wood (*Quart. Journ. Geol. Soc.* vol. xvi. p. 487). The existence of *Elephas antiquus* and *Rhinoceros hemitæchus* as members of the cave-fauna was then for the first time established, and the age of that fauna precisely defined as posterior to the boulder clay or period of the glacial submergence of England. In 1862 Dr. Falconer communicated to the British Association at Cambridge an account of *Elephas melitensis*, the pigmy fossil elephant of Malta, discovered, with other extinct mammals, by his friend Captain Spratt, C.B., in the ossiferous cave of Zebbug and elsewhere. This unexpected form presented the Proboscidea in a new light to naturalists. Further researches on the general questions concerning the same family appeared in a memoir published in the 'Natural History Review' in 1863, the title of which but inadequately indicated the range of the subjects discussed.

While exploring the Himalayas in his early days, Falconer's attention had been closely directed to the physical features which distinguished them from mountain-ranges in temperate regions, and more especially to the general absence from their southern valleys of the great lakes so common in corresponding situations in the Alps. When the hypothesis of the excavation of lake-basins by glacial action was brought forward, he took a share in the discussion and combated the view by an appeal to the contradictory evidence furnished by the Himalayas, the lakes of Lombardy, and the Dead Sea (*Proceedings of the Royal Geographical Society*, 1864, p. 38, and 'Reader,' March and April, 1864). In connexion with this subject it may be mentioned that his last public act was to advocate the grant of £100 by the Council of the Royal Society to Sir Henry James, for accurately determining by levelling the amount of depression of the Dead Sea below the level of the Mediterranean.

For nearly thirty years Dr. Falconer had been engaged more or less with the investigation of a subject which has lately occupied

much of the attention both of men of science and of the educated classes generally, viz. the proofs of the remote antiquity of the human race. In 1833, fossil bones procured from a great depth in the ancient alluvium of the valley of the Ganges in Hindostan were erroneously figured and published as human. The subject attracted considerable attention at the time in India. It was in 1835, while this interest was still fresh, that Dr. Falconer and Capt. Cautley discovered the remains of the gigantic miocene fossil tortoise of India, which by its colossal size almost realized the mythological conception of the tortoise which sustained the world on his back (Geol. Trans. 2nd ser. vol. v. 1837, p. 499).

About the same time several species of fossil *Quadrupeds* were discovered in the Sewalik Hills, one of which was thought to have exceeded in size the Ourang-outang, while another was hardly distinguishable by micrometrical measurements from the living "Hoonuman" monkey of the Hindoos. Coupling these facts with the occurrence of certain existing species, and of the camel, giraffe, horse, &c., in the Sewalik fauna, and with the further important fact that the plains of the valley of the Ganges had undergone no late submergence, and passed through no stage of glacial refrigeration to interrupt the previous tranquil order of physical conditions, Dr. Falconer and Capt. Cautley were so impressed with the conviction that the human race might have been early inhabitants of India, that they were constantly on the look-out for the upturning of the relics of man, or of his works, from the miocene strata of the Sewalik Hills. In their account of the gigantic tortoise, after discussing the palæontological and mythological bearings of the case, they sum up by stating "the result at which we have arrived is, that there are fair grounds for entertaining the belief that the *Colossochelys Atlas* may have lived down to an early epoch of the human period and become extinct since" (Proc. Zool. Soc. 1844, p. 85).

Ten years later Dr. Falconer resumed the subject in India, while investigating the fossil remains of the Jumna. In May 1858, having the same inquiry in view, while occupied with his cave-researches, he communicated a letter to the Council of the Geological Society, which suggested and led to the exploration of the Brixham cave, and the discovery in it of flint implements of great antiquity associated with the bones of extinct animals. In conjunction with Professor Ramsay and Mr. Pengelly he drew up a report on the subject, which, communicated in the autumn of the same year to the Councils of the Royal and Geological So-

cieties, excited the interest of men of science in the case. Following up the same object, he immediately afterwards proceeded to Sicily to examine the ossiferous caves there, and discovered the "Grotto di Maccagnone," in which flint implements of great antiquity were found adhering to the roof-matrix mingled with remains of hyenas, now extinct in Europe. An account of this important case was communicated to the Geological Society (Quart. Journ. of Geol. Soc. 1859, vol. xvii. p. 99). Having examined the collection of M. Boucher de Perthes, on his route to Sicily, he was impressed with the authenticity of some of the flint implements discovered in the valley of the Somme, and urged his friend Mr. Prestwich, who is of the highest authority in this branch of geology, to proceed there and investigate the conditions of the cave. This led to Mr. Prestwich's celebrated memoir on the flint-yielding quaternary deposits of the Somme (Phil. Trans. 1859). Thus, in 1859, the subject of the antiquity of the human race, which had previously been generally discredited among men of science, was again launched upon fresh evidence in both the stratigraphical and the cave aspects. Since then it has been actively followed up by numerous inquirers, and Dr. Falconer himself was contemplating, and had indeed actually commenced, a work on "Primeval Man." In 1863 Dr. Falconer took an active share in the singularly perplexed discussion of the *cause célèbre* of the human jaw of Moulin Quignon; and, in the conference of English and French men of science held in France, he expressed doubts as to its authenticity, but in that guarded and cautious manner which was characteristic of him (Nat. Hist. Rev. 1863, p. 423). In the spring of last year he called attention in 'The Times' to the remarkable works of art by "primeval man" discovered by his friends Messrs. Lartët and Henry Christy in the ossiferous caves of the Dordogne; and in September, in company with myself, proceeded to Gibraltar, to examine caves in which marvellously well-preserved remains of man and mammals, of great antiquity, had been discovered. Before starting, we drew up a preliminary report on the specimens brought from Gibraltar to this country, which was presented to the British Association at Bath. He attached great importance to the results of this expedition, and on his return home at once commenced a careful examination of the fossil remains of Gibraltar, the results of which he intended to elaborate, in conjunction with those of his explorations in Sicily, into a separate work on the Mediterranean Cave-Fauna.

But his labours were at an end. He suffered considerably from

exposure and fatigue on his return journey through Spain from Gibraltar ; so that the inclement winter told with additional force upon a constitution naturally susceptible of cold, and weakened by long residence and exposure in India. On the 19th of January, on his return from a meeting of the Council of the Royal Society, he felt depressed and feverish. The attack speedily became developed into acute rheumatism, complicated with bronchitis and congestion of the lungs, which proved fatal on the morning of the 31st of January. On the 4th of February his remains were committed to their last resting-place, at Kensal Green, in the presence of a large number of his sorrowing friends and fellow-labourers.

From what has been said, it is obvious that Falconer did enough during his lifetime to render his name immortal in science as one of the greatest palæontologists who ever lived. But the work which he published was but a small fraction of that which he accomplished. The amount of scientific knowledge which has perished with him is prodigious ; for he was cautious to a fault ; he never liked to commit himself to an opinion until he was sure that he was right ; and he has died in the fulness of his power, before his race was run. In summing up the character of this remarkable man, those who knew him well can best appreciate his fearlessness of opposition when truth was to be evolved, his originality of observation and depth of thought, his penetrating and discriminating judgment, his extraordinary memory, the scrupulous care with which he ascribed to every man his due, and his honest and powerful advocacy of that cause which his strong intellect led him to adopt ; whilst they, more than others, will have occasion to deplore the death of a staid adviser, a most genial companion, and a hearty friend. His place, indeed, no man can fill.

Thomas Sunderland Harrison, M.D., died at Bath on the 22nd of December, 1864, aged 64. He was at one time lecturer on Midwifery at the Charlotte Street School of Medicine, and was Senior Physician to the Farringdon Dispensary. In later life he had been for many years a Magistrate of the county of Somerset. He became a Fellow of this Society on the 16th of January, 1844.

William Sharp MacLeay, Esq., M.A., &c., was born in London on the 30th of July, 1792, the eldest son of the late Alexander MacLeay, F.R.S., so well known in the annals of this Society, as whose Secretary he acted for the long period of twenty-seven years, or from 1798 to 1825, when he proceeded to Australia

in the capacity of Colonial Secretary, and where he afterwards filled the post of Speaker to the first Legislative Council of New South Wales.

Mr. W. MacLeay was educated at Westminster School and at Trinity College, Cambridge, where he graduated with honours, appearing in the list of Senior Optimes for 1814. On leaving the University he was appointed Attaché to the British Embassy in France, and shortly afterwards became Secretary to the Board for Liquidating British Claims in that country, which was established at the peace of 1815. In this capacity he resided for several years in the French capital, and had thus an opportunity of becoming intimately acquainted with Cuvier and the other eminent men of science who at that time gave lustre to the natural-history schools in Paris. Having discharged the duties of this office with great credit, Mr. MacLeay, on his return to England, was appointed by Mr. Canning in 1825 Commissioner of Arbitration to the Mixed British and Spanish Court of Commission for the Abolition of the Slave Trade, established at the Havannah. In 1830 he was advanced to the higher grade of Commissary Judge in the same Court, and in 1836 became Judge of the Mixed British and Spanish Court of Justice established under the Treaty of 1835.

For the manner in which he discharged the arduous and often delicate duties of these offices, Mr. MacLeay received repeated official approbation. In 1836 he returned to England, and in 1837 retired from the public service upon a superannuation allowance.

His long residence in a tropical climate rendered that of his native country either distasteful or noxious to him, and he consequently, in 1839, joined his family in New South Wales—presiding just before his departure over Section D at the Meeting of the British Association at Liverpool. From that period until his death he remained in comparative seclusion, devoting himself to multifarious studies, to the enlargement of the magnificent collection of insects founded by his father, and to the cultivation of the beautiful gardens attached to his residence at Elizabeth Bay, Sydney, which it was his chief pleasure to improve and to ornament with the choicest native and exotic plants. In this delightful retreat all those who possessed wisdom, wit, or a simple love for scientific truth were made welcome by a host who combined all three, and who in the society of those whom he liked and respected, not only astonished his hearers by the breadth and depth of his knowledge, but charmed them by his thorough geniality

and playfulness. Though bigots and pretenders of all kinds might have found reason to give a different account of the results of their personal intercourse with Mr. MacLeay, he was, to his friends and to all really anxious for information, such as above described. At this residence Mr. MacLeay died after a lingering illness on the 26th of January in the present year.

Mr. MacLeay, after his return from France, where perhaps he acquired his strong taste for zoological pursuits from the example and under the encouragement of such men as Cuvier, Geoffroy St. Hilaire, and Latreille, and especially, as we may suppose, of the latter, and until his departure for Australia in 1839, published numerous papers, chiefly relating to entomological subjects. These papers, up to the year 1839 or 1840, were usually published in the 'Linnean Transactions;' but upon the establishment of the Zoological Society, in which, in conjunction with the late Mr. Vigors, he was very active, most of his more important communications appear to have been given in the 'Zoological Journal' or in the 'Transactions' or 'Proceedings' of the new Society, or in the 'Annals and Magazine of Natural History.' But, besides these scattered memoirs, we are indebted to Mr. MacLeay for two works of very considerable importance. The former of these, entitled "*Horæ Entomologicæ, or Essays on Annulose Animals*," is contained in two volumes, of which the first appeared in 1819, soon after his return from France, and the second in 1821. And it is a curious circumstance that a work which was destined to be exposed to so much criticism should from the first appear to have been doomed to destruction, as if the spirit of conservatism in science were determined to oppose the introduction of new and startling fundamental views. Nearly the whole impression of the first volume was destroyed by fire on the premises of the publishers, whilst the second edition was as near perishing by the opposite agency of water, an unusual rise of the Thames drowning a large part of it. The work, moreover, having escaped these perils, was subsequently exposed to the fortunately less destructive agencies of unfriendly critics, and, it may be added, to the still more dangerous support of injudicious friends.

It would be out of place here to enter into an analysis or criticism of this work, in which, however, it may be said are contained some of the most important speculations as to the affinities or relations of various groups of animals to each other ever offered to the world, and of which it is almost impossible to overrate the suggestive value. Speculative ideas, however, of such a general

kind, even in the hands of their author, are apt to be carried too far in their application, and, when they fall into those of other speculators of less information and less capacity, can hardly fail to be grossly misused. This has been the case with Mr. MacLeay's ideas; and thus, as observed by the author of a notice in the 'Reader,' of his labours, the name of the "circular system" and of "quinarianism" became almost bywords; and the work of one of the most thoughtful and original of English biologists sank at one time into most unmerited neglect.

Mr. MacLeay's second important work, entitled "*Annulosa Javanica, or an Attempt to illustrate the Natural Affinities and Analogies of the Insects collected in Java by Thomas Horsfield,*" appeared, in the 4to form, in 1825. And in 1838 he published a similar work on the "*Annulosa of South Africa,*" also with coloured figures.

The principal papers from his pen that have appeared in our 'Transactions' are:—

1. On the Identity of certain General Laws which have been lately observed to regulate the Natural Distribution of Insects and Fungi (vol. xiv.).

2. On the Insect called *Oistros* by the Ancient Greeks and *Asilus* by the Romans (*ibid.*).

3. Anatomical Observations on the Natural Group of Tunicata, &c. (*ibid.*).

4. On the Structure of the Tarsus in the Tetramerous and Trimerous Coleoptera of the French Entomologists.

5. Remarks on the Comparative Anatomy of certain Birds of Cuba, with a view to their respective places in the System of Nature, or to their relations with other Animals (vol. xvi.).

After his retirement to Australia, I am not aware that Mr. MacLeay published anything; but he has left, as I am informed, a large collection of manuscripts on all subjects of natural history, which, as greatly to the advantage of science, it would be extremely desirable should be carefully examined, and those among them fitted for the purpose published. There is reason, I believe, to hope that this may be done, and that we may, as in former days, again see the pages of the 'Linnean Transactions' graced by articles bearing the honoured name of William Sharp MacLeay.

Jean Jacques de Roches, M.D., one of the oldest Fellows of the Society, into which he was elected on the 18th of November, 1806, died on the 18th of April, 1864, and his decease should have

been announced at the last Anniversary; but the news of it had not at that time reached me.

He was born in 1780, at Geneva, where his father was a Minister of the Gospel and Professor of Oriental Languages in the Faculty of Theology. His son was thus favourably placed as regards education, and he appears to have fully availed himself of the opportunities afforded him.

In 1798, when Geneva fell into the French power, he proceeded to Berlin, chiefly with the view of acquiring the German language. But it was in that city that he also determined upon the choice of a profession, selecting that of medicine. Accordingly, instead of returning to Geneva, he repaired to Edinburgh, at that time perhaps the most celebrated school of medicine in Europe. At that University M. de Roches soon became distinguished for his zeal and talents. In the course of his residence he was a Member and President of the Royal Medical Society, in whose meetings he took a very active part. And during this period of his life he made numerous friends among the most distinguished men of the day. Amongst these may be named especially the Marquis of Huntley, afterwards Duke of Gordon, to whose kind offices in after life he owed a good deal, and Dr. Reeve, an eminent practitioner in Edinburgh, and father of the present Editor of the 'Edinburgh Review.' He took his Doctor's degree about 1803, when he quitted Edinburgh for London, where at first he occupied the post of Medical Officer to a Dispensary, and afterwards established himself in private practice in the neighbourhood of Spitalfields. He did not, however, remain very long in this capacity. Having been offered a medical commission in the British Army then in Portugal, he appears to have given up his practice with a view of accepting the offer; but before doing so he was desirous of once more seeing his parents and of visiting his native city. He accordingly set out for Geneva in company with his friend Dr. Reeve, by a long and circuitous route through Germany. Finding his father in a failing state of health, Dr. de Roche's filial affection induced him to relinquish his prospects in the British service; and he resolved upon remaining in Geneva, and of there pursuing the practice of his profession, in which he speedily acquired great repute. In 1811, as a mark of the esteem in which he was held, he was named Professor of Medicine at the Academy—a chair, however, which circumstances rendered merely honorary.

When Geneva was restored to independence, in 1813, Dr. de Roches entered with great ardour into politics, and was elected

one of the original members of the Representative Council—a post he continued to occupy almost without interruption till he was raised to the honour of a seat in the Council of State in 1830. Up to this time he had continued the practice of his profession, which he now quitted in order to devote himself wholly to the discharge of his public duties. His efforts in a public capacity appear to have been directed to matters of hygiene, the institution and regulation of schools and prisons, and the establishment of a Penitentiary and of a Lunatic Asylum. In 1842, in consequence of political changes, Dr. de Roches vacated his seat in the Council, but nevertheless continued, as long as his strength endured, to discharge in the most conscientious manner all the duties of a good citizen.

The Rev. George Spence, LL.D., was one of the oldest Fellows of the Society, having been elected on the 6th of February, 1827. He died on the 13th of August, 1864, at Lee in Kent, in his 71st year.

W. J. Hawke Spink, M.R.C.S.E., Esq., died at Norton-Malton, Yorkshire, suddenly, of disease of the heart, on the 23rd of February last, aged 45.

Mr. Spink was the nephew and pupil of the late Dr. Spink of Tadcaster, whom he for some years assisted in practice. At his uncle's death, having independent means, he gave up the intention of following the medical profession, and retired to Norton, where he possessed other property. Being a lover of natural history, a botanist, and entomologist, during his retirement he had taken up a special branch of the latter science, namely the collection, classification, and description of a variety of Cocoons, British and foreign,—singular to say, a somewhat neglected subject, and which, had he lived to work it out, doubtless would have formed a speciality of great interest to the natural historian. With the view of laying the result of his labours before his brother naturalists, he had but recently, at the recommendation of Dr. Henry Scott, been proposed and elected to the Fellowship of this Society. But in the very act of accomplishing this work, at a comparatively early age and in the prime of life, he was taken from among us. The perfection of most branches of science owes much to men taking up unhandled subjects, or bringing to light objects of interest from some unbeaten track. In this sense we must admire the labours of Mr. Spink, who was never tired of peering into old trees, or turning up dead leaves, to perfect an interesting speciality, his labours in which, had he been

permitted to pursue them, would have done credit to himself, science, and the Society.

Ludolf Christian Treviranus, M.D., Professor of Natural History and Botany, and Quiescent Director of the Botanical Gardens at Bonn, was born at Bremen, on the 10th of September, 1779. His education, which was commenced in the schools of his native town, was continued first in the University of Göttingen, and afterwards at Jena, where he took his degree of Doctor of Medicine in the year 1801. And it was at this early period of his career that he determined to devote himself with all his power to the cultivation of science,

“Ne vita transeat ceu fumus
In auras abit, vel in fluctus spuma,”

as related by himself sixty-one years afterwards; and perseveringly did he keep to this resolve. He entered upon the practice of medicine in his native city, and in 1807 had acquired such a reputation as to be appointed Lecturer in the Lyceum. But in 1812 he moved to Rostock, where he was appointed Professor of Botany, in succession to Link, who at the same time was translated to Breslau, where Treviranus, strange to say, again succeeded him when Link took possession of Willdenow's chair in Berlin. There he remained till 1830, when the retirement of Nees v. Esenbeck from the chair of Botany at Bonn determined Treviranus to remove to that city as his successor; and there he remained for the rest of his life, although his frequent ill health obliged him to relinquish the immediate management of the Botanical Gardens, which had at first formed part of his charge.

Though active in all branches of botanical science, as is shown in his numerous works and communications to various societies, Treviranus's attention was chiefly directed to the phenomena presented by living plants, and to the accurate determination of species. He was well versed in botanical literature, and took every opportunity of adding to his botanical library. His numerous writings afford abundant proof of the extent of his knowledge, and of the acuteness of his critical faculty. Though so eminent a botanist, it has unfortunately happened that the Gesneracean genus dedicated to his name by Willdenow has since been referred to *Achimenes* of R. Brown, so that the name of Treviranus is deprived of an honour so justly its due. He was made a Foreign Member of this Society on the 4th of May, 1830, and died on the 22nd of May, 1864, two days before our last Anniversary.

The Secretary also announced that nineteen Fellows had been elected since the last Anniversary.

At the Election which subsequently took place, George Bentham, Esq., was re-elected President; William Wilson Saunders, Esq., Treasurer; and George Busk, Esq., and Frederick Currey, Esq., Secretaries. The following five Fellows were elected into the Council, in the room of others going out:—viz. The Rev. Hamlet Clark, Robert Hogg, LL.D., Alfred Newton, Esq., J. T. B. Syme, Esq., and E. H. Vinen, M.D.

Mr. H. T. Stainton, on the part of the Auditors of the Treasurer's Accounts, read the Balance Sheet, by which it appeared that the total Receipts during the past year, including a Balance of £538 17s. 5d. carried from the preceding year, amounted to £1780 7s. 7d., and that the total Expenditure during the same period amounted to £1365 8s. 5d., leaving a Balance in the hands of the Bankers of £414 19s. 2d.

June 1, 1865.

George Bentham, Esq., President, in the Chair.

The President nominated J. J. Bennett, Esq., J. D. Hooker, M.D., John Lubbock, Esq., and W. W. Saunders, Esq., Vice-Presidents for the ensuing year.

W. S. M. D'Urban, Esq., was elected a Fellow.

The following Papers were read, viz. :—

1. "Remarks on the best methods of displaying *Entozoa* in Museums;" by Thomas Spencer Cobbold, M.D., F.R. & L.S.S. (See 'Zoological Proceedings,' vol. viii.)

2. "On Animal Individuality, from an Entozoological point of view;" by the same. (See 'Zoological Proceedings,' vol. viii.)

3. "Contributions towards a Monograph of the Species of Annelides belonging to the *Aphroditacea*, containing a List of the known Species, and a Description of some new Species contained in the Collection of the British Museum;" by William Baird, M.D., F.L.S. (See 'Zoological Proceedings,' vol. viii.)

4. "Synopsis of the *Diptera* of the Eastern Archipelago, discovered by Mr. Wallace, and noticed in the Journal of the Linnean Society;" by Francis Walker, Esq., F.L.S. (See 'Zoological Proceedings,' vol. ix.)

June 15, 1865.

George Bentham, Esq., President, in the Chair.

Joseph S. Baly, Esq., and the Rev. William Colenso, M.A., were elected Fellows.

Mr. Syme, F.L.S., exhibited a living plant of *Cephalanthera rubra*, found by Mr. G. S. Wintle, in beech-woods, in Gloucestershire.

The following Papers were read, viz. :—

1. "Descriptions of 52 new species of *Phasmidæ*, from the Collection of W. W. Saunders, Esq., V.P.L.S., with Remarks on the Family;" by H. W. Bates, Esq. Communicated by Mr. Saunders. (See 'Transactions,' vol. xxv. Part 2.)

2. "On two new Tropical African Genera of *Anonaceæ*;" by Professor Oliver, F.R.S., F.L.S., &c. (See 'Botanical Proceedings,' vol. ix.)

3. "Notes on a Collection of *Algæ* procured in Cumberland Sound, by Mr. James Taylor, and Remarks on Arctic Species in general;" by George Dickie, M.D., F.L.S. (See 'Botanical Proceedings,' vol. ix.)

4. "Supplementary Observations on the *Sphæriæ* of the Hookerian Herbarium;" by Frederick Currey, Esq., M.A., F.R.S., Sec. L.S. (See 'Transactions,' vol. xxv. Part 2.)

5. "On the Asymmetry of the *Pleuronectidæ*, as elucidated by an examination of the Skeleton in the Turbot, Halibut, and Plaice;" by Ramsay H. Traquair, M.D., Demonstrator of Anatomy in the University of Edinburgh. Communicated by Professor Huxley, F.R. & L.SS. (See 'Transactions,' vol. xxv. Part 2.)

Receipts and Payments of the Linnean Society from May 1, 1864, to April 30, 1865.

	£	s.	d.		£	s.	d.
Balance in the hands of the Bankers at the last audit ...	538	17	5	Insurance	15	0	0
Admission Fees	132	0	0	Repairs and Furniture	12	18	11
Compositions	310	10	0	Coals, Gas, Tea, Postage, &c.	93	15	11
Annual Contributions of £1 1s.	2	2	0	Salaries	195	0	0
Do. do. of £2 2s.	42	0	0	Expenses of the Society's Publications	958	10	3
Do. do. of £3 0s.	522	3	0	Books purchased	56	7	4
Transactions and Journal sold	148	4	8	Bookbinding	19	1	0
Dividends on Consols	38	0	6	Commission	14	15	0
Donation from the Rev. Dr. Garnier	10	10	0				
Legacy from B. Botfield, Esq., M.P.	36	0	0	Balance in the hands of the Bankers	£1365	8	5
					414	19	2
					£1780	7	7

W. WILSON SAUNDERS, *Treasurer.*

The foregoing Accounts have been examined, and the Balance in hand found to be correctly stated at £414 19s. 2d.

GEORGE BENTHAM, *President.*
 GEORGE BUSK, *Secretary.*

May 22nd, 1865.

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PROCEEDINGS
OF THE
LINNEAN SOCIETY OF LONDON.

(SESSION 1865-66.)

November 2, 1865.

George Bentham, Esq., President, in the Chair.

Arthur, Viscount Walden, Dr. Bhan Dagee, and J. B. Langley, Esq., were elected Fellows.

Dr. Prior, F.L.S., exhibited specimens of *Benthamia fragifera*, with ripe fruit, grown at Tetton House, Kingston, near Taunton.

It was moved by Mr. Saunders, seconded by Dr. Thomson, and carried unanimously,

“That this Meeting is desirous of recording, at the earliest opportunity, the sincere and profound regret which it has felt at the death of Sir William Jackson Hooker, who, during so many years had been the acknowledged head of Botanical Science in Britain, the labours of whose life had been devoted to giving at once a scientific and a practical character to the study of the Vegetable Kingdom, not only by his own numerous and valuable works, but by the encouragement and assistance afforded to every working botanist, at home and abroad, with whom he was brought into contact.

“The Meeting is especially desirous of giving expression to its grateful recognition of the liberality with which Sir William Hooker opened his most extensive Herbarium and Library to the

use of Botanists, and of which this Society has fully felt the benefit, in the numerous papers read at its Meetings, which could not have been prepared without such assistance.

“That the Meeting also earnestly desires to express to Lady Hooker its sincere and respectful condolence, and to assure her of its deep sympathy in her affliction.”

The following Papers were read, viz. :—

1. “On *Hillebrandia*, a new genus of *Begoniaceæ*,” by Professor Oliver, F.R.S., F.L.S., Keeper of the Kew Herbarium. (See ‘Transactions,’ vol. xxv. part 3.)

2. “On the Law of Leaflet-genesis,” by Harland Coultas, Esq. Communicated by E. Newman, Esq., F.L.S.

3. “Enumeration of Indian *Lemnaceæ*,” by Mr. Sulpiz Kurz, Curator of the Herbarium of the Royal Botanic Gardens, Calcutta. Communicated by Dr. Thomas Anderson, F.R.S. & L.S. (See ‘Botanical Proceedings,’ vol. ix.)

4. “*Lichenes* Novæ Zelandiæ, quos ibi legit anno 1861 Dr. Lauder Lindsay,” by William Nylander, M. & Ph.D., late Professor of Botany in the University of Helsingfors, Russia. Communicated by Dr. Lindsay. (See ‘Botanical Proceedings,’ vol. ix.)

5. “List of *Fungi* collected in Otago, New Zealand,” by W. L. Lindsay, M.D., F.L.S.

6. “Letter from Swinburne Ward, Esq., to Sir W. J. Hooker, on the Coco de Mer (*Lodoicea Seychellarum*) in the Island of Praslin.” (See ‘Botanical Proceedings,’ vol. ix.)

November 16, 1865.

George Bentham, Esq., President, in the Chair.

Sir David Barclay, Bart., the Rev. William Allport Leighton, Capt. Henry Pulleine, George Sigerson, M.D., and Marmaduke Wilkin, Esq., were elected Fellows.

The following Papers were read, viz. :—

1. "Notes on *Medicago sativa*, as apparently affording facilities for the intercrossing of distinct flowers;" by the Rev. George Henslow, M.A., F.L.S. (See 'Botanical Proceedings,' vol. ix.)

2. "Contributions to a Monograph of the *Aphroditacea*; part 2;" by William Baird, M.D., F.L.S. (See 'Zoological Proceedings,' vol. ix.)

3. "On the Spicula of the Regular *Echinoidea*;" by Charles Stewart, Esq. Communicated by Professor Huxley, F.R.S. & L.S. (See 'Transactions,' vol. xxv. part 3.)

4. "Account of a newly discovered British Fish, of the Family *Gadidæ* and the genus *Couchia*;" by Jonathan Couch, Esq., F.L.S. (See 'Zoological Proceedings,' vol. ix.)

5. "Some Observations on British *Salpæ*;" by W. C. McIntosh, M.D., F.L.S. (See 'Zoological Proceedings,' vol. ix.)

December 7, 1865.

George Bentham, Esq., President, in the Chair.

John Gwyn Jeffreys, Esq., and the Rev. Samuel Tarratt Nevill were elected Fellows.

Dr. Kirk, F.L.S., exhibited specimens of the "Tsetse Fly," received by him from the Basle Mission, near Accra, West Africa, a locality in which that insect has hitherto been unknown. The cattle there had suffered for some time, and had died in great numbers, from a disease which was eventually found to be due to the attacks of the "Tsetse."

The following Papers were read, viz. :—

1. "Notes on some of the Climbing-Plants near Desterro, in South Brazil;" by Herr Fritz Müller, in a letter to Charles Darwin, Esq., F.R.S. & L.S. (See 'Botanical Proceedings,' vol. ix.)

2. "Remarks on the genus *Moringa*;" by N. A. Dalzell, Esq., Superintendent of the Botanical Gardens, Bombay. (See 'Botanical Proceedings,' vol. ix.)

3. "On *Arthonia melaspermella*, Nyl.;" by W. Lauder Lindsay, M.D., F.L.S., &c. (See 'Botanical Proceedings,' vol. ix.)

4. "On a double-flowered variety of *Orchis mascula*;" by Maxwell T. Masters, M.D., F.L.S. (See 'Botanical Proceedings,' vol. ix.)

December 21, 1865.

George Benthams, Esq., President, in the Chair.

The Rev. Thomas Wiltshire was elected a Fellow.

The Secretary read a letter from Sir Charles Wentworth Dilke, Bart., dated "Alice Holt, by Farnham, Surrey," announcing that a specimen of the rare Gyr-falcon had just been killed by one of his keepers.

The following Papers were read, viz. :—

1. "On the Metamorphosis of *Chloëon* (*Ephemera dimidiatum*);" by Sir John Lubbock, Bart., F.R.S., V.P.L.S., &c. (See 'Transactions,' vol. xxv. part 3.)

2. "Observations on the habits, history, and microscopic character of the *Cynips Rosæ*;" by Hammett Hailey, Esq., F.L.S.

3. "On Amber;" by Philip John Butler. Communicated by Buxton Shillitoe, Esq., F.L.S.

4. "On some Helminthological Experiments by Professor Leuckart, and on the Relationship existing between the Free and Parasitic Nematoids;" by H. C. Bastian, M.A., M.B., F.L.S.

January 18, 1866.

George Bentham, Esq., President, in the Chair.

The Rev. Charles Clarke, Daniel Giraud Elliot, Esq., Henry Guard Knaggs, M.D., William John MacLeay, Esq., and C. A. Wilson, Esq., were elected Fellows.

Dr. St. Brody, F.L.S., exhibited a packet of "Introduced Plants," collected by himself during the past year, chiefly in the neighbourhood of Gloucester, and a few of which he believed to be new to Britain.

The following Papers were read, viz. :—

1. "Florula of Banda;" by M. P. Edgeworth, Esq., F.L.S. (See 'Botanical Proceedings,' vol. ix.)

2. "On some new British *Polynoina*;" by E. Ray Lankester, Esq. Communicated by John Gwyn Jeffreys, Esq., F.R.S. & L.S. (See 'Transactions,' vol. xxv. part 3.)

Read also two letters, communicated by Dr. Hooker, V.P.L.S., —the one addressed to him by Charles J. Meller, Esq., dated "Bourbon, December 3rd, 1865," and containing some notes on the Botany of the Islands of Bourbon and Madagascar; the other from Swinburne Ward, Esq., dated "Government House, Seychelles, December 5th, 1865," and giving some further information with respect to the "Coco de Mer" (*Lodoicea Seychellarum*).

February 1, 1866.

George Bentham, Esq., President, in the Chair.

Christopher Edmund Broome, Esq., was elected a Fellow.

The following Paper was read, viz. :—

"On some points in the Anatomy of the *Echidna Hystrix*;" by

St. George Jackson Mivart, Esq., F.L.S., Lecturer on Comparative Anatomy at St. Mary's Hospital. (See 'Transactions,' vol. xxv. part 3.)

February 15, 1866.

George Bentham, Esq., President, in the Chair.

William Bowman, Esq., William Bull, Esq., Charles Stewart, Esq., Henry Trimen, M.B., and Edward Woakes, M.D., were elected Fellows.

The following Papers were read, viz.:—

1. "Observations on the origin and geographical distribution of Gum Copal in Angola, West Tropical Africa;" by Frederick Welwitsch, M.D., F.L.S. (See 'Botanical Proceedings,' vol. ix.)

2. "Contributions to the Lichen-flora of Northern Europe;" by W. Lauder Lindsay, M.D., F.L.S., &c. (See 'Botanical Proceedings,' vol. ix.)

3. A letter from Dr. Campbell, F.L.S., to the President, on the increase in the number of Cinchona Plants in the Neilgherry plantations.

March 1, 1866.

George Bentham, Esq., President, in the Chair.

The following Papers were read, viz.:—

1. "On Circulation and the Formation of Wood in Plants;" by Herbert Spencer, Esq. Communicated by George Busk, Esq., F.R.S., Sec. L.S. (See 'Transactions,' vol. xxv. part 3.)

2. "Note on the Existence of the true *Cyperus Papyrus*, L., in Palestine;" by the Rev. H. B. Tristram, M.A., F.L.S. (See 'Botanical Proceedings,' vol. ix.)

3. "Memorandum on the genus *Thamnea*, Sol., and other *Bruniaceæ* contained in the South African Herbarium of the late Dr. Burchell, F.L.S.;" by Professor Oliver, F.R.S. & L.S., Keeper of the Kew Herbarium. (See 'Botanical Proceedings,' vol. ix.)

March 15, 1866.

George Bentham, Esq., President, in the Chair.

John B. George, Esq., and Colonel Charles Shelley were elected Fellows.

The following Papers were read, viz. :—

1. "Account of a *Lusus Naturæ*, a double-headed Water-Snake;" by John Shortt, M.D., F.L.S., M.R.C.P.L., &c. (See 'Zoological Proceedings,' vol. ix.)

2. "Descriptions of six new species of simple-fronded *Hymenophyllaceæ*;" by John Gilbert Baker, Esq. Communicated by Dr. Hooker, F.R.S., V.P.L.S. (See 'Botanical Proceedings,' vol. ix.)

3. "Lichenes Amazonici et Andini lecti a Dom. Spruce;" by the Rev. W. A. Leighton, B.A., F.L.S. (See 'Transactions,' vol. xxv. part 3.)

April 5, 1866.

George Bentham, Esq., President, in the Chair.

John Gilbert Baker, Esq., Charles Gainer, M.D., and Henry

Lee, Esq., were elected Fellows; and Mr. Thomas Edward was elected an Associate.

The following Papers were read, viz. :—

1. “On a new British *Fungus* ;” by the Rev. M. J. Berkeley, M.A., F.L.S. (See ‘Transactions,’ vol. xxv. part 3.)

2. “On some undescribed species of *Teredo*, from Australia ;” by E. P. Wright, M.D., F.L.S. (See ‘Transactions,’ vol. xxv. part 3.)

3. “Note on the presence of Stamens within the Ovarium of *Bæckeia diosmæfolia*, Rudge ;” by M. T. Masters, M.D., F.L.S. (See ‘Botanical Proceedings,’ vol. ix.)

April 19, 1866.

George Bentham, Esq., President, in the Chair.

William Robinson, Esq., was elected a Fellow.

Sir Charles Bunbury, Bart., exhibited a cone of *Wellingtonia gigantea*, produced (with several others) at Great Barton, Suffolk, in the autumn of 1865, on a tree planted only two years previously, and now scarcely three feet high. Sir Charles had not been able to find male flowers on any plant of the same species at Barton.

Mr. Samuel Gurney, F.L.S., exhibited several eggs of the Emu, laid within the last few weeks, and stated that the *male* bird was at present incubating a considerable number. One of the eggs now exhibited was remarkable for its large size, bright green colour, and smooth surface. This egg had been deposited after an interval of three days, instead of four, which was stated to be the usual period.

The following Papers were read, viz. :—

1. "Notes on the Structure of *Myrtaceæ*;" by George Bentham, Esq., F.R.S., Pres. L.S. (See 'Botanical Proceedings,' vol. ix.)

2. "On the Structure of *Indigofera*, as apparently offering facilities for the intercrossing of distinct flowers;" by the Rev. George Henslow, M.A., F.L.S. (See 'Botanical Proceedings,' vol. ix.)

3. "List of the Diurnal *Lepidoptera* recently collected by Mr. Whiteley in Hakodadi, North Japan;" by Arthur G. Butler, Esq., F.Z.S., Assistant, Zoological Department, British Museum. Communicated by William Carruthers, Esq., F.L.S. (See 'Zoological Proceedings,' vol. ix.)

May 3, 1866.

George Bentham, Esq., President, in the Chair.

George French Angas, Esq., and William Matchwick, Esq., were elected Fellows, and Dr. Nathan Pringsheim and Dr. W. P. Schimper were elected Foreign Members.

The following Papers were read, viz. :—

1. "Monograph of the recent British *Ostracoda*;" by George S. Brady, Esq. Communicated by Dr. Sclater, F.R.S. & L.S.

2. "On the Otolites of Fish, and their value as a test in verifying recent and fossil species;" by E. T. Higgins, Esq. Communicated by George Busk, Esq., F.R.S., Sec. L.S. (See 'Zoological Proceedings,' vol. ix.)

3. "Remarks on the Cranial and Dental Characters of the existing species of *Hyæna*;" by George Busk, Esq., F.R.S., Sec. L.S. (See 'Zoological Proceedings,' vol. ix.)

Read also a Letter from Dr. Masters, F.L.S., referring to the exhibition, at the last Meeting, by Sir Charles Bunbury, of *Sequoia* (*Wellingtonia*) *gigantea*, produced last autumn at Great Barton;

and calling attention to the fact that cones of that species had been formed in this country, and recorded in the 'Gardener's Chronicle' as far back as 1858.

The President announced that the first part of the Library Catalogue was now printed, and would be ready for publication in a few days, at the price of ten shillings to the public, and seven shillings and sixpence to the Fellows.

May 24, 1866.

Anniversary Meeting.

George Bentham, Esq., President, in the Chair.

This day, the Anniversary of the Birth of Linnæus, and the day appointed by the Charter for the Election of Council and Officers, the President opened the business of the Meeting with the following Address:—

GENTLEMEN,

IN reviewing the proceedings of our Society during the past year, it will be seen that we have continued to devote our attention chiefly to the development of the two great means we possess of promoting biological science, our publications and our library. In the general plan of our octavo Journal we have thought it expedient to make a slight alteration. Owing to the number of Journals in this country through which zoologists can procure the speedy issue of purely systematic unillustrated contributions, the papers they have presented to us have been chiefly of a character requiring quarto illustrations; and it was found that if the old plan had been adhered to, of making up each number of the Journal of equal moieties of the two great branches of our science, the publication of important botanical contributions would be frequently delayed, from the deficiency of corresponding zoological matter. From the present volume, therefore, we have adopted the separate issue of zoological and botanical parts; and the botanists in this respect are already considerably in advance of the zoologists. In our quarto Transactions, on the other hand, the zoologists occupy the principal part. Our usual issue

last autumn was of unprecedented bulk, and has been acknowledged as comprising contributions of great scientific value. Including the extra part published in the summer, our year's Transactions are illustrated with 43 plates, of which 23 are zoological and 20 botanical; and we have also increased the number of plates introduced into our Journal. Our next quarto part, for which several plates, chiefly zoological, are already in hand, will complete our 25th volume; and a general index to the whole series is in preparation. It is hoped also that in the course of the autumn or winter two detached papers of great interest, illustrated by a considerable number of plates, will be delivered to you as the first two parts of the 26th volume—viz. Mr. Brady's Monograph of Ostracoda, read at your last meeting, and a selection of the most interesting botanical novelties collected in West Tropical Africa by Dr. Welwitsch, an account of which he has promised to lay before you on an early day.

Our Library has received considerable additions. The valuable conchological works presented several years since by the late Mr. Cuming, but which he had temporarily borrowed, are now definitively lodged on our shelves. Several important works have been presented,—among which I may specially mention the Zoology of Beechey's Voyage, presented by Dr. J. E. Gray, and very numerous Transactions and Journals of Natural-History Societies, as well as separate works contributed by their authors. We have also expended on the library a sum of about £65, which has enabled us to increase the number of periodicals we subscribe to, and to procure, besides several indispensable works of reference, nearly all the works entered by our fellows in the book of Desiderata, including Malherbe's splendid monograph of Piciidæ.

The printing of our Library Catalogue has occupied rather more time than we calculated upon, our Librarian having been most scrupulous in his attention to the accuracy of its details. The first part, however, containing under an alphabetical arrangement all separate works and detached papers, as well as complete Journals published by private editors independently of scientific bodies, received by the Society up to June 1864, is complete. As the second part, comprising Transactions of Societies and Journals in progress, will yet require some months to complete, the Council have thought it would be more satisfactory to the Fellows to publish the first part at once; and it is now on sale at the Society's apartments.

Owing to the heavy cost of our publications, we have not added

much to our pecuniary reserve. We have, however, kept our bills paid off even more closely than usual, and duly invested the £100 presented to the Society by the executors of the late Sir William J. Hooker, carrying our funded property to a total of £1400. We commence also the new year with a larger cash balance in hand than usual.

I last year expressed a hope that some means might be found for establishing a closer connexion between the Linnean Society as the head of biological science in this country, and special societies established for the cultivation of particular branches of it. I trust that the step which has been taken in this direction may lead to successful results, arrangements having been made, by which the Zoological Society has been allowed during the next Session to hold its Scientific Meetings in our rooms, on the Thursdays alternating with our own. A nearly similar application, since made by the Entomological Society, has been favourably entertained by the Council; but the details are still under consideration.

The number of Fellows elected during the year has been greater than usual; but our losses have been severe, imposing a heavy task on our Secretary in those interesting obituary notices which he is accustomed to lay before you. I have no desire to anticipate these in any respect; but, from personal feeling, I cannot refrain from alluding to the blank left by the death of the two eminent men with whom I had for so long been on terms of the most intimate friendship, and to whom I owe so much. Sir William Jackson Hooker and Dr. Lindley, the one for forty-two, the other for thirty-nine years had been more or less connected with my career; for there is not one of my botanical works or publications in which I have not benefitted by that assistance, advice, or encouragement they were always ready to bestow upon all contributors to the science they both so zealously pursued. They are also ever present to my mind as the last of the chief actors in bringing to a successful conclusion that second great revolution in the science of botany, nearly the whole course of which it has been my fate to witness. Half a century back, when first I entered upon the study of plants, the first and greatest revolution in natural science, the reduction to order of the primitive chaos by the establishment of the Linnean genera, species, and binomial nomenclature, had for some time been fully accomplished. But the benefits derived from this organization were so keenly felt, its final triumph over the violent opposition it had met with from various quarters so strong in the recollection of botanists, that any at-

tempt at further improvement was generally scouted as an infringement of established laws. The new Jussieuan system, although it had been promulgated for twenty-seven years, was scarcely known out of France. In Germany and the North it was quite ignored. In England, Robert Brown's labours had already established him as one of the great reformers of the science; but his works were not in general circulation, and the Linnæans still reigned paramount. It was only in France that De Candolle's '*Flore Française*' had brought the study of plants according to their natural affinities within reach of the merest tyro; and many were those I then knew, whom, like myself, that work alone had attracted to the science, notwithstanding the ridicule and abuse with which it was assailed by the would-be conservatives of the time, several of whom, like Picot de Lapeyrouse, had then considerable influence. I returned to England temporarily in 1823, and finally in 1826, with my firm conviction of the paramount importance of the natural system strengthened by the personal acquaintance with Jussieu, De Candolle, and other eminent French botanists to which I had been admitted, and could only feel surprise at the admiration felt in this country for those Linnæan classes which I had only half learnt as a matter of history. The first of our botanists from whom I received marked attentions and civilities was our then President, the late Sir James Edward Smith; and he vainly endeavoured to impress me with the simplicity, practical utility, and consequent superiority of the Linnæan arrangement. Even those who had begun to look upon the study of natural orders as a higher branch, to be entered upon by botanists who were already proficient in the science, insisted that it was unsuited for beginners or for those who confined themselves to local botany. The few admirers of Jussieu in this country then generally admitted as an undeniable axiom a proposition retained to this day, by force of habit, in the Preface to one of our standard Floras (which gives it up in practice), that long experience "has proved to every unprejudiced mind that no system can be compared to that of the immortal Swede, for the facility with which it enables any one, hitherto unpractised in Botany, to ascertain the genus of some previously unknown plant." To this I could only oppose my own experience, and that of friends, who appeared to me to have determined most of the plants of their neighbourhood, by the sole aid of the '*Flore Française*,' far more readily than those who had invariably to begin by counting stamens and pistils. With these impressions on my mind, it was but natural

that the proffered friendship of the two men who were already turning the study of botany in this country into its proper channel should have induced me to devote my future life to the same science. They both of them evinced a liberality, then rare, in the exchange not only of specimens but of ideas, and in their communications and assistance to young aspirants, no fear of rivalry ever entering into their minds. Without a taint of selfishness, they both had the progress of science thoroughly at heart; both of them saw that the general adoption of a natural classification was one great means of carrying it out, and applied themselves to that purpose, each in his own way. Hooker's was chiefly by the force of example and the general influence he had acquired. Ever courteous with those whose views were different from his own, he gave way for a time in those elementary and local publications in which his position in the Scotch Universities did not leave him independent action; but in his teachings he strove to familiarize his pupils with the leading features of the natural orders; he adopted them exclusively in the arrangement of his collections, in his extensive distributions, in his wide-spread correspondence, and in those numerous works on exotic plants which were so rapidly diffused over the botanical world. Lindley's advocacy was more uncompromising and controversial, but it was accompanied by the same active liberality; and his teachings were backed by such powerful arguments and by works of such high scientific value, that the part he took in effecting the reform was as great as that of Hooker; and both lived to see the final abandonment of the Linnæan classes in this country, even for the most trifling local catalogue.

In zoology it appears to me that a similar change has been effected, not by the nominal substitution of one specific system for another, but by a gradual recognition of the principle which I believe now governs the study of all branches of natural science, but which was laid down by Linnæus for genera only. This is, that groups of beings of every degree, from the primary class to the lowest race, are not to be limited by some one character in outward form taken *à priori* as essential, but by the comparative study of every peculiarity in outward form, internal structure, constitution, and habit of life. One consequence has been the great development given in recent years to the study of animal and vegetable anatomy and physiology, and to the biological history of the individual, the species, the genus, or the class; whilst systematic zoology and botany, once supposed to make up almost the

whole of the science, is now, by a species of reaction, often treated with contempt. This is, however, surely a mistake. Without a good system, clearly identifying the subjects of observation, no biological inquiries can have any practical advantage; and, in all our reviews of the progress of our science, we ought equally to appreciate the labours of the systematist, the physiologist, and the biologist, provided that each in his own department has duly called in aid the results obtained in the others.

In laying before you a few notes on some of the principal publications in Natural History, since I last referred to the several departments (in my addresses of 1862, 1863, and 1864) I have, in respect of zoology, been enabled to avail myself of the kind assistance of Mr. W. S. Dallas, of the Museum at York. On applying to him for data on which to found this part of my address, he has remitted to me a general sketch which appears so well adapted to the purpose, that I cannot do better than to insert it at length in his own words, as giving a far better account of the progress of the science than I could otherwise have obtained. I would myself, however, particularly call your attention to the 'Record of Zoological Literature,' of which the importance is by no means overrated by Mr. Dallas, who takes, I believe, himself a large share in the labour of its preparation. Not only is it earnestly to be desired that it may receive sufficient support to ensure its continuance, but it is to be hoped that a similar compilation may be undertaken for botanical literature. It is one of those works which, for the sake of the real working man of science, every amateur who has the means ought to encourage.

In approaching the consideration of the literature of Zoology during the past two years, we are met at the outset by the difficulty, that the mass of memoirs of more or less importance published on different zoological subjects is so enormous that those to which we can refer must bear a very small proportion to the whole; and the task of selection is thus rendered by no means easy. In the following notes the endeavour has been to call attention to those papers and other works which seem to have done most for the advancement of our knowledge of the particular department to which they relate, or promise to lead to general zoological progress; but even these are so numerous that in many cases little more can be done than to indicate their titles.

Of works directed specially to the advancement of our general zoological knowledge, the most important that has appeared for

many years, perhaps since the second edition of Cuvier's *Règne Animal*, is Bronn's 'Klassen und Ordnungen des Thierreichs,' which is still in progress,—the portion treating of the Mollusca having been continued since the death of the distinguished projector of the work, and completed last year by Dr. Keferstein, whilst the section relating to the Arthropod classes has lately been commenced by Dr. Gerstäcker. This work is remarkable for the immense amount of information which is brought together in its pages, and for the copiousness of its illustrations. The 'Philosophia Zoologica,' of Professor Van der Hoeven, published at Leyden in 1864, may also be noticed here, although only as placing known facts occasionally in a somewhat new light. But the most important publication connected with the progress of general zoology, of the period over which we have to glance, is the first volume of the 'Record of Zoological Literature,' containing an abstract of the zoological works and papers published in 1864. For the production of this work, zoologists are indebted to Mr. Van Voorst, one of the Fellows of this Society, and to the zeal of Dr. Günther, of the British Museum, aided by a staff of well-known coadjutors. The enormous extent to which the literature of zoology has attained at the present day, may be judged from the fact, stated by Dr. Günther, that the 'Record' for 1864 forms a guide to scientific works and papers occupying more than 25,000 pages; and these do not constitute the whole of the publications of that year.

Taking now the several primary classes of the Animal Kingdom separately, we must refer, in the first place, to the great work of our distinguished Fellow, Professor Owen, the 'Comparative Anatomy and Physiology of Vertebrates,' two volumes of which, completing the anatomical review of the structure of vertebrate animals, have made their appearance. It will be unnecessary to attempt any criticism of the contents of these volumes. Other naturalists may dissent from Professor Owen's views as regards certain points both of classification and of the interpretation of anatomical facts; but they will nevertheless find in this book a clear enunciation of the results of widely extended researches.

The investigations of zoologists upon the class of Mammalia seem to have been directed of late more especially to two orders, the Chiroptera and the Cetacea, both of which present considerable and peculiar difficulties in their study; and the most important works upon this class lately issued have reference to these groups. The Smithsonian Institution has published a

‘Monograph of the Bats of North America,’ by Mr. H. Allen, which must be regarded as a most valuable contribution to our knowledge of those animals, and has been worked up with great care by the author. Professor Peters has also read many important papers on different genera of Bats before the Berlin Academy of Sciences, which have appeared in the ‘Monatsberichte’ of that Society; he has also a monograph of the Chiroptera in preparation, which will be illustrated with numerous plates. Among the numerous papers on the Cetacea, in which the osteology of those animals is carefully studied for the purposes of generic and specific determination, those of Mr. Flower, published in the ‘Proceedings’ of the Zoological Society, may be regarded as taking the first place. The editors of the ‘Annales des Sciences Naturelles’ have also published a very important posthumous memoir by the late Professor Eschricht of Copenhagen, “On the Geographical Distribution of the Northern Whales.” Dr. Gray, of the British Museum, has lately given us a new ‘Catalogue of Cetacea,’ a work displaying a great amount of research, and bringing together the results arrived at by former authors in a manner which cannot but render it exceedingly useful.

In recording the proceedings of Ornithologists, the first place is due to our countryman Mr. John Gould, whose magnificent works, on the Birds of Asia and of Britain, have each advanced by several parts in the last two years. The former, as usual, contains life-like representations of the many splendid and elegant feathered inhabitants of the Asiatic continent; the latter is distinguished from all previous illustrated works on British birds by the insertion upon the plates of representations of the young or nestling forms of many of the species, which cannot but be of the greatest advantage to future investigators of this department of the natural history of our island. Mr. Gould has also published a new edition of the text of his great work on the Birds of Australia, in the form of two octavo volumes, which will prove more convenient for common reference than the bulky folios in which the work originally appeared. Dr. Jerdon’s ‘Birds of India,’ of which the third and concluding volume made its appearance in 1864, is likewise an exceedingly valuable text-book of the ornithology of that magnificent region, and is especially important on account of the great number of accurate personal observations on the habits of the birds which it contains. ‘The Ibis,’ which has commenced a new series, under the able editorship of Professor Alfred Newton, and the ‘Proceedings of the Zoological

Society' contain an immense number of Ornithological papers of great value, to which, however, space will not allow us to allude; but we cannot pass in absolute silence the valuable memoirs, "On the Osteology of the Gallinaceous Birds and Tinamous," by Mr. W. K. Parker, and on "the Skeleton of the Great Auk or Gar-fowl," by Professor Owen, published in the Transactions of the last-mentioned Society. Our own Transactions have also contained an elaborate paper by Mr. A. R. Wallace, "On the Parrots of the Malayan Region," with a discussion of the general geographical distribution of the Psittacidæ in accordance with the spirit of the Darwinian hypothesis.

The ornithologists of other countries have been no less active than our own; but we can only notice two or three of the most important of their productions. In the United States, the Smithsonian Institution has commenced the publication of a Review, by Dr. S. F. Baird, of the American Birds in its Museum, with critical remarks on many of the species: this will form a valuable aid to the student of the geographical distribution of American birds. Another important North American work is the 'Monograph of the Tetraoninæ,' by Mr. D. G. Elliott of New York, in which all the species of that subfamily of birds, so abundantly represented in the northern part of the American continent, are not only described, but well figured of the size of life. The natural history of the species is also very well given, and the young states of several of them are figured. Figures of the newly hatched young of many species of other groups are also published by M. Marchand, in Guérin's 'Revue et Magasin de Zoologie.' Professor Schlegel has continued his admirable 'Revue critique et méthodique du Muséum des Pays-Bas,' containing catalogues of the species of various families of birds contained in the fine Museum of Leyden, with valuable remarks upon many of them; and Dr. Pelzeln, of Vienna, has brought out the ornithological section of the 'Zoology of the Voyage of the Novara.'

Among the publications on Reptilia, we have again to give the first place to a work produced in this country—namely, Dr. Günther's 'Reptiles of British India,' published by the Ray Society. In this splendid work, the author has described the whole of the Reptilian inhabitants of continental India, the number of which, including both true Reptilia and Batrachia, is no less than 526. Besides the descriptions of groups and species, this volume contains notices of the habits of many of the animals, and some remarks on the geographical distribution of the Indian

Reptiles; whilst the value of the book is greatly increased by the beautiful plates with which it is illustrated, and of which it is sufficient to say that they are from the pencil of Mr. G. H. Ford. A work of almost equal value with the one to which we have just referred, but taking a zoological instead of a geographical limit for its subject-matter, is the elaborate memoir "On the Geographical distribution of the Chelonia," by Dr. Strauch, in the 'Mémoires de l'Académie Impériale des Sciences de St. Pétersbourg;' and a smaller work, a history of British Reptiles, by Mr. M. C. Cooke, although designed for popular purposes, is, from the spirit in which it has been executed, quite worthy of mention here.

M. Duméril has lately made some observations on the development of that curious Batrachian the Axolotl (*Siredon mexicanus*), which may, perhaps, eventually lead to a modification of our views as to the nature of that animal, and perhaps of the so-called Perennibranchiate Batrachia generally. From his communications to the French Academy of Sciences in November last, we learn that young animals produced from ova deposited by long-gilled Axolotls in the Menagerie at the Garden of Plants, after attaining an age of eight months, and a size about equal to that of their parents, suddenly underwent a change, losing the branchial tufts, and becoming considerably modified both in external appearance and in some points of internal structure. These observations open up the curious question, whether the Axolotls which have been living for two years in Paris, and from the ova of which these young animals have been reared, are really only larval (or tadpole) forms of some species the perfect condition of which is indicated by M. Duméril's specimens. We may also mention two elaborate memoirs on the anatomy of the Batrachia,—namely, the first number of 'Abhandlungen über die Perennibranchiaten und Derotremen,' by Dr. J. G. Fischer, devoted to the description of the anatomy of the hyoid and branchial arches and their muscles in various species of the Perennibranchiate group; and Professor Hyrtl's anatomy of *Cryptobranchus japonicus*.

The most important contributions to Ichthyological literature during the past two years are the continuation of Dr. Günther's Catalogue of Fishes in the British Museum, and the commencement of an "Histoire Naturelle des Poissons," by M. Auguste Duméril, in Roret's Suites à Buffon. Of the former, the fifth volume was published in 1864, and carries the revision of the true bony fishes to the commencement of the order Physostomi, the last extensive order of that subclass. This valuable work may now,

therefore, be regarded as approaching its completion. The first volume of M. Duméril's work is devoted to the typical Chondropterygii of Cuvier (the Elasmobranchi of modern authors), including the Sharks, Rays, and Chimæras. This volume contains an elaborate anatomical introduction and historical analysis of the authors who have treated of these fishes, and systematic descriptions of the groups and species.

The seventh volume of the *Mémoires de l'Académie de St. Pétersbourg* contains an elaborate memoir on the Mormyridæ, "Die Familie der Mormyren", by Dr. Marcusen, which is especially valuable from the careful comparative anatomical investigation which the author has bestowed upon these Fishes. The published portion of the Zoology of the voyage of the Austrian frigate *Novara* includes the descriptions of the new fishes collected, by Professor Kner; and Professor Bleeker has continued his magnificent folio 'Atlas Ichthyologique des Indes Orientales Néerlandaises.' The only ichthyological publication of local interest, to which we need call your attention, is Mr. Couch's History of the Fishes of the British Islands, the last portions of which have appeared within the last two years. Although essentially a popular work, it contains, as might have been expected from the reputation of the author, a great number of interesting observations on the habits of our British Fishes; and the plates, although not pretending to great scientific accuracy, are in general sufficiently good to afford considerable assistance to the student in determining the species.

On the Mollusca, the late Mr. Lovell Reeve had up to a recent period continued his 'Conchologia Iconica,' chiefly illustrating genera of bivalve mollusca. And of detached papers we may notice the memoir of Messrs. Alder and Hancock on a Collection of Nudibranchiate Mollusca made in India by Mr. Elliot, published in the Transactions of the Zoological Society, which makes us acquainted with many very singular forms of those creatures, and one by M. Schwartz von Mohrenstern on *Rissoa* ("Ueber die Familie der Rissoiden," part ii.), published in the *Denkschriften der Akademie der Wissenschaften in Wien* for 1864.

If the contributions to the natural history of the Mollusca during the last two years have not been particularly numerous or important, this is by no means the case with the next great division of the animal kingdom, that of the Arthropoda, or Insecta in the Linnean sense. Here, especially in entomology properly so called, we have a mass of literature from which it would not be

difficult to pick out an immense number of works deserving of notice, either on account of their subject-matter and its bearings upon general questions of natural history, or their mode of treatment. In fact, with every desire to select only the most important publications, we shall have to refer to so many memoirs, that we can do little more in most cases than cite them by their titles.

Commencing with the Crustacea, we must first notice an important work by Dr. Fritz Müller of Desterro, entitled "Für Darwin," in which the author discusses at considerable length the evidence on the origin of species by evolution to be derived from the study of the Crustacea. In the course of this discussion a great number of valuable observations, especially on the development of the Crustacea, are brought together; and the whole of the evidence, in the author's opinion, tends strongly to the confirmation of the hypothesis of Mr. Darwin. Several observers have lately published papers on the metamorphoses of the Crustacea; and among these the first place must be given to those of Dr. Müller, in Wiegmann's Archiv, his memoirs on the metamorphoses of the Shrimps and Prawns being especially valuable. M. Hesse, of Brest, has also published an interesting memoir "On the *Pranizæ* and *Ancei*," describing the very singular mode of life followed by these creatures, whose very position in their class can hardly be regarded as clearly established; and Professor Lilljeborg's elaborate paper, on the curious parasitic Cirripedes forming the families Sacculinidæ and Peltogastridæ, has been republished in the Annales des Sciences Naturelles. The zoological portion of the Voyage of the Novara includes descriptions and figures of the new Crustacea, by Dr. Heller.

The classes Arachnida and Myriopoda, which are generally rather neglected by zoologists, have constituted the subject of some valuable works. The most important of these is Mr. Blackwall's History of the Spiders of Great Britain and Ireland, published by the Ray Society, which, completing the revision of the results of that gentleman's long-continued researches upon the British Spiders, already partially published in the Transactions of our Society and in the Annals and Magazine of Natural History, and combining them with those of Mr. Templeton's investigations upon the Irish species, furnishes a body of information upon the subject such as no other country can boast. Another valuable work upon the Araneida is M. Eugène Simon's 'Histoire Naturelle des Araignées,' which aims at giving a complete review of the genera of that order of Arachnida, and,

although disfigured by some faults both of omission and commission, will be found exceedingly useful to the student. The anatomy of the circulatory system of the Spiders has been elucidated by M. Claparède, by an investigation of this apparatus in the genus *Lycosa*, originally printed in the *Mémoires de la Société de Physique et d'Histoire Naturelle de Genève*, but reprinted in the *Annales des Sciences Naturelles*, and translated in the *Annals and Magazine of Natural History*.

On the Myriopoda we have to record the production of no such works as those just alluded to; but two important geographical memoirs have lately appeared,—one by M. Humbert, “On the Myriopoda of Ceylon,” in the *Mémoires de la Société de Physique et d'Histoire Naturelle de Genève*; the other, “On the Myriopoda of North America,” by Dr. H. C. Wood, in the *Transactions of the American Philosophical Society*. Both these works contain carefully elaborated descriptions of the genera and species; and the latter enters in some detail into the discussion of the mode of classification: both are illustrated with good figures. We may also indicate a paper by Professor Peters, entitled “A Revision of the Myriopoda of the family *Polydesmi* contained in the Royal Museum of Berlin,” published in the *Monatsbericht of the Berlin Academy of Sciences for 1864*.

In treating of the entomological literature strictly so called of the past two years, we may commence by the consideration of one or two papers which have a general bearing independently of their mere entomological interest. One of these is the production of an American entomologist, Mr. B. J. Walsh, who calls attention to certain differences occurring in insects admitted to belong to the same species, in accordance with the nature of the food-plant, and endeavours to apply the results thus obtained in support of the theory of the origin of species by evolution from preexisting forms. To such different forms of the same species Mr. Walsh gives the name of *phytophagic varieties*; and he assumes that by their being excluded from intercourse with the forms feeding on other food-plants they may, in course of generations, give rise to *phytophagic races*, or even to what he calls *phytophagic species*, which would be either averse to, or quite incapable of, interbreeding. If this view can be maintained, it is evident that the hypothesis above alluded to will derive most important support from it. A memoir which will render great assistance to any European entomologist who will attempt to work out the problem enunciated by Mr. Walsh is Dr. Kaltenbach's “*Deutschen Phytophagen*,”

still unfinished, in the Transactions of the Natural-History Society of Rhenish Prussia. In this paper the author enumerates the German plants, in the alphabetical order of their generic names, and gives lists of the species of insects of all orders found feeding upon each. About three years ago Professor Wagner of Kasan announced his discovery of the larva, apparently, of a dipterous insect, which was capable of producing other similar larvæ through a certain number of generations—as he thought, by a change of the fatty mass of the body. A translation of Wagner's paper, published in the Zeitschrift für wissenschaftliche Zoologie, has appeared in the Natural-History Review. Since the first announcement of this astonishing discovery (which, it is needless to say, was received with much incredulity by zoologists), Professor Wagner and others have succeeded in rearing the perfect insect of this singular larva, which proves to belong to the family Cecidomyidæ, and has been described by Meinert under the name of *Miastor metraloas*, in a memoir published in Kröyer's Naturhistorisk Tidsskrift. Various papers on these viviparous larvæ have appeared in the German scientific journals; and a digest of the results of some of them will be found in the Annales des Sciences Naturelles for 1865. Perhaps the most important of the more recent papers is that by Professor Leuckart, in the Archiv für Naturgeschichte for last year, translated in the Annals of Natural History for March 1866, in which the author shows a strong analogy between the mode of formation of the peculiar reproductive bodies of the larva and that of the ordinary ova of insects.

The periodical publications specially devoted to entomological subjects in this country, on the continent of Europe, and in America continue in full activity; and even in New South Wales we find an Entomological Society publishing in its Transactions papers of considerable value. But before proceeding to the consideration of any of these or of the many other entomological papers to which we shall have to call your attention, it may be as well that we should first devote a few words to those contributions to the literature of entomology which have appeared in our own publications. These have been neither few nor unimportant. In the first rank of them we must place the elaborate "Monograph of the Nitidulariæ," by Mr. Andrew Murray, commenced in the concluding part of the twenty-fourth volume of our Transactions, a work of immense labour and research upon an obscure and difficult group of Beetles. The same part contained also a short paper, by Mr. Haliday, "On

a new genus of Insects belonging the Thysanura," characterized by that accuracy of investigation and philosophical tone which always lead us to regret that its distinguished author should have published so little. The first part of our twenty-fifth volume was entirely occupied by an entomological memoir on the Papilionidæ of the Malayan Region, by Mr. A. R. Wallace, with especial reference to the important questions of variation and geographical distribution. Our Journal also, during the past two years, has contained the completion of Mr. Walker's descriptions of Diptera collected by Mr. Wallace in his eastern travels. These, indeed, seem to have singularly attracted the attention of entomologists to the varied insect fauna of the rich tropical islands of the Eastern archipelago; and both in this country and on the continent great activity has been displayed in the production of more or less monographic treatises on the entomology of the Malayan region. In our Journal, Messrs. Smith and Walker have published the complete revision of the species of Hymenoptera, Diptera, Lepidoptera, and Homoptera brought home by Mr. Wallace; and the Entomological Society has devoted two separate volumes of its Transactions to the reception of treatises on the Longicorn and Phytophagous Beetles of the Malayan region, by Messrs. Pascoe and Baly. Abroad, M. Henri Deyrolle has published descriptions of the Malayan Buprestidæ of the Wallacean collections, in the *Annales de la Société Entomologique de Belgique*; and the Abbé de Marseul has described the Malayan Histeridæ in his new periodical, '*L'Abeille*;' whilst the chief of the Dutch entomologists, M. Snellen van Vollenhoven, has commenced a series of monographs of the insect inhabitants of the Dutch East-Indian possessions, two of which, treating of the Scutellerides and Pierides, have already appeared.

Turning now to special entomological monographs without reference to geographical limits, the first place must be given to Professor Lacordaire's '*Genera des Coléoptères*,' of which the seventh volume, completing the classification of the Curculionidæ and also including some allied groups, has recently appeared. The well-established reputation of this most valuable work renders any further reference to it superfluous. As a sort of pendant to it, however, we may notice a remarkable monograph, by M. Chapuis of Verviers, on the Platypides, a subfamily of the Bostrichidæ, with which Professor Lacordaire closes his volume. These are small wood-boring Beetles, of which about 16 species were previously described; M. Chapuis now describes no fewer

than 202, the majority of the new forms being either from the Malayan region or from Tropical America, collected by Mr. Wallace and his former companion Mr. Bates. M. James Thomson's '*Systema Cerambycidarum*,' a generic synopsis of the Longicorn Beetles by the possessor of the most extensive collection of those insects in existence, also deserves mention here; likewise the commencement of the Catalogue of Phytophaga by the Rev. Hamlet Clark. Quitting the Coleoptera, we have to notice Dr. Gustav Mayr's memoir on the Formicidæ of the voyage of the Novara, which contains a synopsis of the rather numerous genera admitted by that author in the family of the Ants; and also the commencement of Messrs. C. & R. Felder's account of the Lepidoptera collected on the same voyage, the publication of which was preceded by that of the first part of a complete synonymic list of Lepidopterous Insects, by the same authors, in the *Verhandlungen der zoologisch-botanischen Gesellschaft* of Vienna.

Passing to those works which treat only of the insects of particular regions, we must give the first place to two volumes published by Mr. T. V. Wollaston, whose magnificent treatise on the Coleoptera of Madeira is well known. The first of these is a Catalogue of Canarian Coleoptera, published in 1864 by the Trustees of the British Museum; the second, under the title of "*Coleoptera Atlantidum*," gives a complete comparative list of the Coleopterous inhabitants of the Madeiran and Canarian groups of islands, which may possibly represent the highest summits of that great submerged continent, or Atlantis, which has been supposed to have been formerly united with the land which now forms Europe. The importance of Mr. Wollaston's investigations into the Coleopterous fauna of these islands is to be found in the fact of the identity or near relationship of most of the Beetles to European forms,—species apparently identical with the latter being found associated with others presenting certain local peculiarities not sufficient for specific distinction, and with others, again, in which the differences from their continental relations is so great as to induce Mr. Wollaston to describe them as distinct species, although, in many cases, evidently with considerable doubt. Hence it would appear, especially to a partisan of the Darwinian hypothesis, that we have to do in these islands with the remains of a great partially extinct fauna, coincident in many of its forms with that still existing in Europe, but also possessing some peculiar types, the

descendants of which still give a certain character to the Coleopterous fauna of the islands ; but by the long-continued segregation of the species during the gradual submergence of the land, and the changed conditions to which the European species would thus be exposed, many of them have become more or less altered, producing either marked varieties, or apparently distinct specific forms. To this view, however, Mr. Wollaston does not give in his adhesion ; and his arguments have considerable force ; still we cannot but think that in these islands we have a natural experiment, on a large scale, for testing the validity of the hypothesis of the evolution of species.

Our space warns us that we must dismiss the remainder of the Entomological works to which we have to advert with almost a bare mention. The sixth and seventh volumes of the admirable 'Skandnaviens Coleoptera' of M. C. G. Thomson of Lund appeared in 1864 and 1865, and include descriptions of the Scandinavian *Serricornes*, *Heteromera*, and *Rhynchophori*. Several families of European Beetles have been treated more or less monographically by the Abbé de Marseul and other French entomologists, in 'L'Abeille,' the periodical already mentioned as having been established by him. Dr. Stål has completed his monograph of the American Chrysomelidæ, in the Nova Acta of the Academy of Upsal. Another Swedish entomologist, M. Holmgren, has published the first part of an 'Ichneumonologia Suecica,' which promises to furnish an admirable monograph of the Scandinavian Ichneumonidæ ; and Dr. Taschenberg has given, under the title of "Die Hymenopteren Deutschlands," a synopsis of the European genera of Hymenopterous Insects, which will prove most serviceable to entomologists. In America, Mr. E. T. Cresson has published a descriptive synopsis of the Hymenoptera of Cuba, in the Proceedings of the Entomological Society of Philadelphia for 1865 ; and the same periodical for 1864 contains an important memoir by Mr. B. D. Walsh on the Cynipidæ, with especial reference to the occurrence of dimorphism and parthenogenesis in that family.

An important work for the student of European Lepidoptera is Dr. Werneburg's 'Beiträge zur Schmetterlingskunde,' which contains a synonymic analysis of all the descriptive works on that order down to the close of the last century. Mr. Stainton's Natural History of the Tineina has been continued, the eighth and ninth volumes having appeared in 1864 and 1865 ; and from Sydney we have three parts of a fine folio work on the Australian

Lepidoptera, by Mr. A. W. Scott, illustrated with good figures drawn by that gentleman's daughters.

Upon the lower and less studied orders of insects, the works of sufficient importance to require mention here are not numerous. Dr. Schiner's *Diptera of the Austrian Fauna*, published in 1863 and 1864, is a valuable handbook for the student of the European species of that order; and the same author has published two memoirs on the venation of the wing in the *Diptera*, and on the classification of those insects, in the *Verhandlungen der zoologisch-botanischen Gesellschaft in Wien* for 1864, and also a systematic catalogue of the *Diptera of Europe*. Dr. Loew of Meseritz has continued his monographs of the North American *Diptera*, in the *Smithsonian Contributions*, the monograph of the *Dolichopodidæ* having appeared in 1864. The obscure and difficult group of the *Trichoptera* or *Phyganidæ* has formed for some years the chief object of Mr. McLachlan's studies; and last year the results of his investigations were published by the Entomological Society. This appears to be an admirable memoir, carefully elaborated, and is profusely illustrated with figures of structural details, drawn by the author himself. The '*British Hemiptera*' of Messrs. Douglas and Scott, published by the Ray Society, also comes opportunely to fill up a gap in our entomological literature; but few other works of any consequence have appeared on this order, if we except the '*Hemiptera Africana*' of Dr. Stål, of which the first part, including the descriptions of the African *Scutata*, appeared in 1864.

With regard to the lower forms of animal life, we have only to mention a very few memoirs. On the *Annélida*, M. de Quatrefages has published, in the *Comptes Rendus* of the Academy of Sciences at Paris, and in the *Annales des Sciences Naturelles*, the tabular synopsis of the classification which he intends to adopt in his great work on these animals, to be published in the *Suites à Buffon*. In 1864 Professor Claparède brought out a valuable memoir on this class of animals in the *Mémoires de la Société de Physique et d'Histoire Naturelle de Genève*, under the title of "*Glanures zootomiques parmi les Annélides de Port-Vendres*;" and Professor Ehlers published the first portion of a work entitled "*Die Borstenwürmer nach systematischen und anatomischen Untersuchungen dargestellt*." Both these works are of great value, as is also a conjoint memoir by MM. Van Beneden and Hesse, which has appeared in the *Mémoires de l'Académie Royale de Belgique* under the title of "*Recherches sur les Bdellodes et les Trématodes marins*."

The remarkable researches by which some considerable insight has already been gained into the life-history of those mysterious creatures, the parasitic worms, are still being carried on by numerous observers with the happiest results; and although there is still much that is problematical in the history of some of the commonest forms, investigators are now pretty well aware of the direction in which their researches should be pushed. Professor Leuckart, to whom we are indebted for much of the knowledge which we already possess on this obscure department of zoology, has lately published an important work on the parasites of Man, and Dr. Cobbold a general Introduction to the Study of Helminthology, both of which contain a great amount of valuable zoological information. Professor Leuckart has also published some "Helminthologische Mittheilungen," devoted almost entirely to the description of the various modes of development prevailing among the Nematode worms, and containing many highly interesting original observations.

Some valuable observations by Dr. Alexander Agassiz on the embryology of the Echinodermata are given in the Memoirs of the American Academy; and Professor Baur publishes his three memoirs on the natural history of *Synapta digitata*, in the first two of which the anatomy and development of that singular creature are described in considerable detail, while the third is devoted to the investigation of the still more singular molluscan parasite which was discovered in it by the late Johannes Müller.

In connexion with the Cœlenterata, we shall call your attention only to the first part of the 'Beiträge zur Naturgeschichte der Hydromedusen,' lately published by Dr. Hæckel, which contains an account of a very singular mode of reproduction in some of the Geryonidæ. And of the literature treating of the lowest of all forms of animal existence, we need only mention the first volume of Dr. Bowerbank's 'Monograph of the British Spongiadæ,' lately published by the Ray Society, which contains an account of the anatomical structure, physiology, and classification of Sponges in general, with a discussion of the characters by which the species may be distinguished.

In systematic phænogamous Botany I have not much to report upon. But little progress has been made in the general works in course of preparation, and the monographs published have been but of little extent; yet something has been done. Dr. Hooker and myself have to apologize for the tardy issue of the second

part of our *Genera Plantarum*; but the labour it entails is long and tedious, and we both of us are much impeded by other works which we cannot suspend, as well as by other occupations which unavoidably encroach upon our time. We confidently hope, however, to send to press the third part, completing the volume, soon after the summer recess.

Of De Candolle's *Prodromus*, since the detailed report I had occasion to make of it in the *Natural-History Review* for October 1864, only one part has appeared, containing *Cupuliferæ* and some of the small allied orders by De Candolle himself, with 327 species, whilst other small orders, by Casimir de Candolle, comprise 87 species. Both had previously published detached papers on subjects suggested in the course of working them up; and De Candolle has since inserted in the *Actes de la Société Helvétique* a paper on the venation of the leaves of *Fagus*, comprising, amongst other observations, one of those cautions to palæontologists in their determination of genera from the fragment of a leaf which are now arising from so many quarters. The genus *Euphorbia*, by Boissier, which I had mentioned as forming one part of the *Prodromus*, has now been illustrated by the author in a handsome folio volume containing 193 plates of the most interesting species. The printing of the remainder of *Euphorbiaceæ*, by J. Mueller of Argau, is, I am happy to learn, far advanced, and we may at length hope to see that vast, important, and difficult order rescued from the chaos into which it has been thrown by independent publications in all parts of the world. That *Piperitæ*, by Casimir de Candolle, are approaching completion, is shown by the forestallment of new species inserted in the last part of Seemann's *Journal of Botany*, and by a memoir on their anatomical structure, for the *Actes de la Société Physique de Genève*, just received from the author.

The last series of Walpers's supplementary compilation has been brought to a close by Carl Mueller, including all works he had access to up to the year 1855. He announces a new series for the ten years from 1856 to 1865, on a reduced scale, so as to give a better chance of an early completion. On the other hand, I regret to observe allusions to the state of the author's health preventing any positive engagement as to the periods of issue. Such a work is now so essential to the systematic botanist, as giving a clue to where he is to search for published species, that it is to be sincerely hoped the publishers will make such arrangements as to ensure its continuation.

Of monographs of detached groups we have (besides small con-

tributions far too numerous to mention even by name), from Russia, Bunge's revision of Anabaseæ, and monographs of *Cousinia* and *Echinops*, all well illustrated, in the Memoirs of the Petersburg Academy, and Regel's monograph of *Betula* and *Alnus*, in the Moscow Bulletin: from Germany, the conclusion of Hanstein's Gesneraceæ, and Klatt's Irideæ, in the Linnæa; a continuation of Schultz Bipontinus's Compositæ, in the Pollichia; and various Orchidaceous papers of Dr. Reichenbach, fils, dispersed through a variety of periodicals: from France, the commencement (containing the general matter) of a monograph, by E. Bureau, of Bignoniaceæ, an order now requiring, perhaps more than any other, a judicious rearrangement of genera (the work is in quarto, with illustrations well executed, as are now all botanical plates published in Paris); and by Decaisne, in the Annales des Sciences Naturelles, a revision of the curious little order or tribe of Pedalineæ. Two young men, Count Leonce de Lambertye, and a son of Professor Milne-Edwards, have published memoirs on Solanaceæ—the former from a horticultural, the latter from a popular and pharmaceutical point of view; and Eugène Fournier has communicated to the Société Botanique de France, some papers on the very difficult question of the classification of Cruciferae, in which order, it must be confessed, natural tribes with any approach to definitiveness of character have not yet been proposed, and perhaps do not exist. Our own Journal contains a careful monograph of *Restio*, by Maxwell Masters, which we trust the author will soon continue through the rest of the order; and in the last part of our Transactions is a monograph, by Miers, of the little group of Conanthereæ. The same experienced botanist has, in a series of papers on Menispermaceæ, in the Annals of Natural History, severely criticised our own as well as Eichler's views of the genera and species of that order; and Seemann, in his own Journal of Botany, has published a rearrangement of a portion of Araliaceæ.

Next to general Genera and Species of Plants, and monographs of large groups, the most useful works to the systematic botanist are complete Floras of extensive regions. With regard to central and northern Europe, the vegetation has long been well studied. France, Switzerland, Germany, Belgium, Denmark, and Sweden, as well as our own country, possess standard Floras, alluded to in my address of 1862, all good, although varying in form, extent, and plan, requiring only new editions to embody corrections and additions in matters of detail, and in many instances improvement

in form, especially as to the diagnoses destined to facilitate the finding out the names of plants.

The observations of detail made by local European botanists upon the vegetation of their own several districts are of great value; they form the principal data for establishing the limits of species, races, or varieties, for determining those facts of geographical distribution upon the correctness of which must depend all speculations as to their causes, for leading us to a history of the life of a species as well as of the individual. Even the mania for characterizing every variation of form as a species has no doubt brought to light many curious facts illustrating the frequent hereditary permanency of minutely aberrant forms once produced, and corrected many of our previous ideas of the absoluteness of any test by which we can determine what is or what is not a species; and within the last few years these local observations have been as numerous and important as at any previous period; the Journals and Transactions of local Societies, of which I last year gave a sketch, are full of them. But they are mixed up with so much of repetition, so many long details that have been given over and over again, so much of patient observation and lengthened explanation to prove results of no use whatever to the botanist, general or special, that these papers are for the most part practically ignored. This is nowhere more fearfully exemplified than in Jordan's recently published "*Diagnoses d'espèces nouvelles ou méconnues*," the adoption of which would surely produce anything but a "*flore réformée*" of France and adjacent districts. Supposing, even, he were to succeed in proving that *Draba verna* is divisible into nearly a hundred distinguishable varieties or races, we may well ask in what does that advance science? for what purpose, systematic, physiological, phytogeographical, or practical, can we ever want to treat of *Draba verna* but as a single aggregate? We cannot but hope, therefore, that those acute observers who devote themselves to the study of critical plants will carefully go through all these innovations, pick out the sterling coin from the chaff in which it is buried, and consign the results to the new French and German Floras, or new editions, several of which must shortly be required, retaining for the benefit of the general botanist the species in the Linnæan sense (now often called super-species), attach to them any new characters discovered, eliminate all descriptions (beyond a simple mention) of such evanescent hybrids as occur often only in a single individual, and reduce all subspecies and minor varieties to their proper level.

In point of form, there has been a considerable change, consequent upon the gradual but final abandonment of the Linnæan system. That system was originally accompanied by one of Linnæus's admirable methodical contrivances the separation of the diagnosis and the description, which have in the course of time been so signally confounded and perverted. His plan was to contrast the most important or striking characters in short diagnoses (never to exceed twelve words) with a view to giving a ready clue to the name of a plant, and to give a detailed description to enable the student to confirm the identity of his plant, and to teach him what is known concerning it. Lamarck and De Candolle's plan was in principle the same; but the diagnosis is given in a tabular form. Until lately, in all general works as well as in local Floras, the diagnosis has been nominally retained, but in a form which deprives it of all its advantages. It is no longer a Linnæan diagnosis, but a description in an ablative form, or a description of certain classes of characters only, the remainder being reserved for what is specially called the description. Many of the more recent Floras have reunited the whole into one description, replacing the diagnosis by italicizing a few contrasted words, as was very well done by Koch in his Synopsis of the German Flora. His example was followed by Grenier and Godron in their Flore Française, and by Babington in his British Manual, but with an arrangement of the descriptions according to an *à priori* estimate of the importance of characters, which is by no means of practical convenience. Of late years also the tabular dichotomous or nearly dichotomous diagnoses, or analytical keys, are getting more and more into vogue, and when well done from actual comparison of specimens, and not extracted only from descriptions, are, I believe, the most practically useful. But nothing is more difficult than to contrast specific characters in a large genus so as not to lead the student astray; and the careless manner in which many recent analytical keys have been drawn up has tended very much to throw discredit on the system. There is also some difference in the form adopted for these keys. The tabular form, indenting the subdivisions, as used occasionally by Koch and other Germans, is, I believe, the best where the species are not numerous or can be distributed into well-marked sections. The bracketed analytical keys of De Candolle and most French botanists are very convenient where the species are numerous or complicated in their relations, requiring cross references. The least convenient of all is the running the divi-

sions together in continuous lines, as in Miquel's *Flora Indo-Batava*.

The recently published *Flore Française* of Gillet and Magne is, for species, almost exclusively confined to bracketed analytical keys, into which more or less of descriptive matter is introduced. This, accompanied by excellent typographical execution, seems at first sight to offer great clearness and exactness; but a closer examination creates some disappointment. The student does not always want merely to be led to the name of his plant, but quite as frequently to verify the name he has obtained by that or other means; and for this purpose these broken descriptions are very inconvenient. And in point of execution, the endeavours to avoid copying from De Candolle have not always been happy. Taking the first few brackets of the general table, always of great importance to the beginner, De Candolle had already in the second bracket detached the large and easily defined groups of compound flowers. This in Gillet and Magne's table is deferred to the sixth bracket,—being preceded in the third bracket by the separation of diœcious, from monœcious polygamous and hermaphrodite flowers—a very puzzling one to the beginner, unless limited in the first instance, as is done by De Candolle, to the separation of unisexual from hermaphrodite flowers; in the fourth bracket, by the distinction of tubular or verticillate perianths from those reduced to one or two scales, the student having here to *include* in tubular perianths those numerous Cichoraceæ which he has to *exclude* from them at p. 194; and in the fifth bracket by the separation of Papilionaceæ, a much less numerous and more complicated group than that of compound flowers. The great rule to be kept in view in these dichotomous analytical keys is, first, that the divisions should be as clearly defined as possible; secondly, that they should divide the species as equally in numbers as possible.

The tabular diagnoses in Leo Grindon's '*British and Garden Botany*,' are evidently done with great care and well adapted for popular use; but the collateral subdivisions are sometimes much too numerous. Class III. (p. 69), for instance, comprises seventeen, which are far from being well contrasted with each other; and the utility of the book is in some measure marred by the disturbance of the scientific arrangements, and a general appearance of disorder in the details.

In illustrated Floras, progress has been made both in Germany and in our country. The new edition of our '*English Botany*,' in the full luxury of typography and illustration, is a great proof

of the interest taken in the study of plants by our wealthy classes. The work comes too near home for me to venture upon any critical remarks as to its merits; but I may be allowed to express a hope that a greater number of the old dissections upon the plates may be replaced, as some have been, by magnified details more in accordance with the present state of science. In Germany, Reichenbach's '*Icones Floræ Germanicæ et Helveticæ*' is being steadily proceeded with. It is now in its twenty-first volume, or thirty-first if the previous ten of '*Plantæ Criticæ*' be included. After this, four more will be required to complete the work, which will then contain, for a comparatively moderate price, a more perfect illustration of the flora of the whole of central Europe than has yet been carried out for any extensive region. The dissections in the latter volumes, by the younger Reichenbach, are particularly good. It may be that the existence of this work is one cause for which France is not even commencing a separate illustrated Flora of her own.

For the southern States of Europe, I had occasion, in the *Natural-History Review* for October 1864, to report on the state of the Floras of the three great southern Peninsulas; since when the only addition of any importance has been the appearance of the first part of the second volume of Lange and Willkomm's '*Prodromus Floræ Hispanicæ*,' the importance of which I had in the above-mentioned article pointed out. It is with sincere regret that I see, by a notice in the *Botanische Zeitung* of the present year, p. 116, that the sale of the work has been so far from compensating the outlay, that, unless 50 more subscribers be immediately obtained, the publishers will be compelled to give it up, an appeal to which, it is to be hoped, all zealous students of European botany will cheerfully respond.

The Russians continue active in the investigation of the natural history of their vast territory. In a long list of botanical works and papers recently published by them, which I owe to the kindness of Dr. Regel, there are many, chiefly from the *Transactions* of the Petersburg Academy, and from the *Moscow Bulletin*, supplying data for future editions of Ledebour's Flora. Dr. Regel himself has described the plants of Semeinow and others, and leads us to hope that the general Flora of Eastern Siberia, which he commenced several years since, will now soon be continued. A Flora of Moscow, just published by N. Kaufmann, in the Russian language, is marked as good, but has not, as far as I am aware, yet reached this country. Several elementary and

physiological works, also in the language of the country, are reported to me as well calculated to familiarize the Russians with our interesting science.

The Japanese flora, to the peculiar interest of which I called attention in my address of 1862, has been the subject of some further investigations. Very rich sets of excellent specimens have been received from thence and from Formosa, collected by Mr. Oldham, whose recent loss is so much to be deplored; a portion of the former has been published by Oliver in our own Journal. Miquel, under the title of "*Prolusio Floræ Japonicæ*," has commenced a digest of the Japanese collections of Thunberg, Siebold, Buerger, Pierot, and Textor, of which we have received three parts in folio, although without plates: when these are gone through, he proposes, in a second series, to go through the miscellaneous sets of Japanese plants in the Dutch herbaria. This ought to give us a tolerably complete view of the Japanese flora; but we cannot but wish that the whole had been consolidated in one enumeration, that some order had been followed in the sequence of the families, and that some form had been adopted more convenient than the folio, which the absence of illustrations renders quite unnecessary.

In East India we have many active botanists; and partial papers on Indian plants, by Aitchison, Anderson, Beddome, Dalzell, Edgeworth, Kurz, Thomson, and others, continue to be inserted, chiefly in our own Journal and Transactions, but also in similar publications in India itself; and Thwaites's important Enumeration of Ceylon Plants, which I mentioned in 1862, is now complete. The progress, however, of the general Flora of East India has, I regret to say, been much retarded by the state of Dr. Thomson's health last winter; but I trust he will now be able again to take it up actively. The Dutch botanists, with Miquel now at their head, continue to illustrate the rich and, in many respects, little-known flora of their own East-Indian possessions and neighbouring independent islands, chiefly in the periodicals and Transactions enumerated in my last year's Address. We have not, however, since then received any continuation of the *Annales Musei Botanici Lugduno-Batavi*.

For Mediterranean Asia and the Egypto-Arabic region we have had detached papers in our Journal, especially by Lowne, on the flora of the rich oasis at the southern end of the Dead Sea, and by Redhead, on that of the desert of Sinai. Kotschy has published several papers in the Austrian Journals and Transactions; and I

understand that the first volume of Boissier's general Flora of the Levant is ready for the press.

Amongst the regions of which the flora has hitherto been comparatively little known, there are certainly none offering more interest than that of tropical Africa, not only from the number of new forms it discloses to us, but from the extraordinary number and diversity of generic types with a very small specific average to each, and from the curious connexions it exhibits on the one hand with the flora of the Eastern archipelago and Ceylon, and on the other with that of tropical America, together with many peculiar types of its own. In my Address of 1862, I mentioned several of the rich collections accumulated in our herbaria; since that, Dr. Welwitsch has brought over the whole of his own, with a view to their determination and publication; the remainder of Dr. Kirk's have also been received; and amongst several additions, the most interesting have been perhaps the plants collected by Speke and Grant in their celebrated journey through the region of the sources of the Nile. All these have been partially illustrated by detached papers, chiefly in our Transactions and Journal; and our Government has sanctioned the consolidation of the valuable information thus scattered, or yet to be gleaned from the specimens, in a general Flora of tropical Africa. This has been undertaken by Professor Oliver; and the first volume is, I believe, far advanced. In the mean time, German botanists have, to a certain degree, been working upon the same subject. Several papers on plants of the Upper Nile, by Kotschy, have appeared in the Transactions and Proceedings of the Academy of Sciences or of the Botanical Society of Vienna; and I have heard that a considerable portion of a more general work on the Ethiopian flora has been for some time in print. The herbarium of the Jardin des Plantes at Paris also contains many novelties from the Gaboon; and in the distribution from Kew of the duplicates from our own collectors, a first set has been sent to that establishment, some of which have been, perhaps rather too hastily, published by the writers in the 'Adansonia.'

The flora of Southern Africa, so remarkably contrasted with that of the tropical regions in the enormous specific diversity it exhibits, as well as in the peculiarly limited geographical range of individual species, would, we had every reason to hope, have been speedily laid before us in a complete shape, in the admirable 'Flora Capensis' of Harvey and Sonder. Dr. Harvey himself

had completed the *Compositæ* in the third volume, published last year, and was actively proceeding with the fourth when he was seized with the illness which has terminated fatally within the last few days and added one more to the heavy list of eminent botanists and excellent men whose loss during the twelve-month we have to deplore. His last instructions before his decease related to the means of securing the completion of his *Flora* and the publication of the new edition he had prepared of his 'Genera of the Cape Flora.'

In Australia, Ferdinand Mueller continues to display the same extraordinary zeal and activity. The fifth volume of his '*Fragmenta Phytographiæ Australiæ*' is nearly complete, in which, with his usual accuracy of detail, he continues to describe the novelties he receives, establish and reduce genera, and consolidate species with increasing boldness. He has also published a general sketch of the vegetation of the Chatham Islands, and a volume of "Lithograms" or plates, intended for the continuation of his elaborate *Flora* of Victoria, which I sincerely hope he will now resume. To Dr. Hooker we owe the first part (completing Phenogamous plants) of an excellent '*Manual of the New Zealand Flora*,' reducing to the convenient octavo form the elaborate and more expensive work he had previously published, and embodying the large mass of new discoveries since received. The second part, comprising Cryptogamic plants, is in the press. The very rich collections received at Paris from their new possessions in New Caledonia, comprising much that is new and of high interest, are being gradually made known, in a series of papers by Brongniart and Gris, in the *Annales des Sciences Naturelles* and the *Bulletin de la Société Botanique de France*. And Seemann has published three parts of his '*Flora Vitiensis*' or *Flora* of the Fiji Islands, in quarto, with excellent illustrations by Fitch, bringing the work down to *Umbelliferae*.

In North America, none of the great works, neither the Botany of the American Exploring Expedition nor the general *Flora* of North America, have yet been resumed; but a few botanists are actively at work, and amongst them none more so than Asa Gray, whose well-known accuracy of detail, connected with great correctness of general views, a thorough knowledge of general botany in all its branches, and a philosophical mind, has given him so high a rank among the votaries of the science, and imparts so much value even to detached papers proceeding from his pen. Among those which have recently appeared, chiefly in the Pro-

ceedings of the American Academy, are several illustrative of collections of plants made in various little-known parts of the North American continent, monographs of American genera, especially of *Astragalus*, and important notes on Rubiaceæ, Compositæ, and other orders not yet published in the Botany of the American Exploring Expedition.

For the West Indies, Grisebach has completed his Flora of the British possessions, and has since been specially occupied with Cuban plants from American collectors, and has supplemented the enumeration he had published in the Transactions of the American Academy of Sciences by papers in the Göttingen Transactions and Journals.

For South America, Martius's great work on Brazilian botany proceeds steadily. Since my last report the principal orders illustrated and described have been,—Scrophulariaceæ, by J. A. Schmidt; the several Polypetalous orders commencing the Candolleian series, by Eichler, who has at the same time supplemented his account of Menispermaceæ by a separate paper in the Munich Transactions; Coniferae and allied orders, also by Eichler; Sapotaceæ, by Miquel; Eriocaulæ, by Körnicke; Gnetaceæ, by Tulasne; Ericaceæ, by Meisner; Gesneraceæ, by Hanstein; Salsoleaceæ, by Fenzl; and Gentianaceæ, by Progel.

Planchon and Triana's Flora of New Granada has been commenced, in detached portions, in the Annales des Sciences Naturelles. A first portion, comprising the Thalamifloræ, has been reissued in a separate volume. The Ferns (by Mettenius), Selaginellas (by A. Braun), Mosses (by Hampe), and Hepaticæ (by Gottsche) have since appeared; and I understand that M. Triana, who is now in this country, has made arrangements with his government by which he will be enabled actively to prosecute his great work at Kew.

In the above review I have not included the voluminous contributions to Systematic Botany by Baillon and his friends in the 'Adansonias;' for I was desirous of saying a few words generally upon that work, which is rather a *recueil* than a periodical. There is no doubt that the papers it contains display a great amount of careful observation, patient investigation, and ingenious views of affinities which cannot be neglected by systematic botanists, and that upon Euphorbiaceæ especially M. Baillon has bestowed great pains; but it must also be admitted that the whole is marred, not only by the irregular mode of publication, but by a frequent neglect of consulting what has

been previously published, a thorough conviction of the paramount importance of organogenesis, and very peculiar views of what is meant by method and how it should be carried out. What Baillon had begun in Euphorbiaceæ, and what the younger Agardh had attempted in a general system, appears to have been followed out, under the same school, for the benefit of the pupils at the Jardin de l'École de Médecine at Paris. In the table of the Natural Orders as there taught, and given in the 'Adansonia,' we learn for instance that Polygoneæ are Chenopodeæ with solitary erect orthotropous ovules, that Lorantheæ are Polygoneæ with the stamens opposite the petals, and that Juglandeæ are apetalous Lorantheæ with declinuous flowers. It would logically follow that a Walnut is a Goosefoot. It appears to me that it would give just as clear an idea of affinities if we were to say that an Oak is a Moss with a woody stem and amentaceous flowers. As to the want of research, we may quote the genus *Eremopyxis* of Baillon, which had already been twice detached from *Bæckeæ* by others — or Marchand's long paper on the structure of the stem in Phanerogams, where we have only to contrast his single page of bibliography with the thirty-seven pages of Oliver's paper in the Natural-History Review for July 1862, required for the enumeration of the works and papers published on the same subject.

In Cryptogamic Botany, I need not to mention the numerous publications on Ferns which the increasing taste for the cultivation of that beautiful tribe has extracted from scientific, semi-scientific, or purely popular writers. But whilst we have reason to congratulate ourselves that the late Sir William Hooker had completed his great 'Species Filicum,' we cannot but regret that the condensed Synopsis, in which he embodied all recent discoveries, and with which he had made great progress, should have been cut short by his lamented decease, without being sufficiently advanced to give us any hope of its completion by other hands.

In Mosses and Lichens, the recent contributions have been chiefly detached papers on those of local districts, or of special collections made by travellers, and inserted in a great variety of Journals and Transactions at home and abroad. On the general subject I have only to mention Schimper's supplements to the 'Bryologia Europæa,' and a supplement by Nylander to his 'Synopsis Lichenum.'

With regard to Fungi, I was struck with the simultaneous

and independent observations of De Bary at Leipzig, and Ørsted at Copenhagen, on the identity of *Æcidium Berberidis* and *Puccinia Graminis*, so unexpectedly illustrating the popular prejudice, as it has been called, of the effect of the Barberry in producing Rust in corn. Having never devoted myself much to the study of Mycology, I applied to my friend Mr. Currey for a few notes on these papers, and on any others recently published illustrating this singular class of beings, the tremendous effects of which on the development of animal and vegetable life, and consequently on the main interests of human existence, are becoming daily more evident. Responding to my wishes, Mr. Currey has given me a detailed summary too long for me to read on the present occasion, longer indeed than I should otherwise have thought of inserting; but it appears to me to be a sketch of the most important results of recent investigations so useful to the naturalist who has little time to devote to the special subject, that I have no hesitation in embodying it in this Address. I have only to add that De Bary's "Morphologie und Physiologie" of Fungi, Lichens, and Myxomycetæ, forming the first part of the second volume of Hofmeister's 'Handbuch der physiologischen Botanik,' which I shall presently refer to, has only reached us since the following notes were drawn up.

Cesati and De Notaris's treatise on the Ascigerous Sphæriacei* is an attempt to rearrange this vast group of Fungi, which is estimated to contain at least 2000 species. The authors give a short account of the successive views of the different botanists who have from time to time treated of this class of Fungi, and then propose a fresh systematic arrangement, in which they rely mainly upon the substance and texture of the perithecia, and the form and nature of the sporidia. They consider that in general the stroma affords no sufficient characteristics for precise classification—although it is of value in some cases, when its nature is well defined. They separate the entire family into two great divisions,—1st, the Hypocreacei, which includes the genera *Cordyceps*, *Claviceps*, *Torrulia*, *Hypocrea*, and *Nectria*; and 2ndly, the Sphæriacei, which they subdivide into 37 genera, 13 being proposed for the first time.

In reference to the same subject, Mr. Currey has published, in

* Schema di classificazione degli Sferiacei Italiani aschigeri più o meno appartenenti al genere *Sphæria* nell' antico significato attribuitogli da Persoon. Per V. Cesati e G. de Notaris. Genova, 1863.

the 25th vol. of the Trans. Linn. Soc., some observations supplementary to his former papers on the *Sphæriæ* of the Hookerian Herbarium. His object has been to show which of the species, previously figured by him, were described from authentic specimens, and, with regard to the non-authentic ones, to state by whom the plants have been named. The result shows that the Herbarium contains a large number of authentic specimens, besides many which, without being absolutely authentic, are almost (if not quite) as valuable, from having been identified by Fries, and published by him in the 'Scleromycetes Sueciæ' or described in the 'Systema mycologicum.'

The main interest of De Bary's paper on the fructification of the Ascomycetes*, consists in the observations on *Erysiphe Cichoracearum*, DC., in which the author traces the origin of the perithecium from its earliest state up to the formation of the single ascus and spores. He notices two cells as being always present and visible from the earliest period, one of which he conjectures may be the female, and the other the antheridium or male organ. He says that the cell by the division of which the ascus and its coating are formed, only develops itself when it has been in contact with the antheridium; and he considers it very probable that impregnation is effected by such contact, and that the perithecium of *Erysiphe* (excepting the outer wall) is the product of such impregnation.

De Bary's paper on vegetable parasites† was undertaken with a view to contribute to the solution of the question as to the origin of parasitic fungi; and he concludes (as might be expected) that endophytes are not produced from the metamorphosed substance of diseased plants, but that they originate from germs which penetrate healthy plants and develop a mycelium. In the course of his investigations he notices the occurrence, in the genus *Cystopus*, of organs similar to those long since discovered by Tulasne in *Peronospora*, and which have been called oogonia. He observes that ramifications from the mycelium attach themselves to the oogonia, and conjectures that these ramifications perform the functions of antheridia or male organs; and he pro-

* Ueber die Fruchtentwicklung der Ascomyceten. Eine Pflanzen-physiologische Untersuchung. Von Dr. A. de Bary. Leipzig, 1863.

† "Recherches sur le développement de quelques champignons parasites. Mémoire pour servir de réponse à une question proposée par l'Académie des Sciences en 1861, et pour servir de Supplément aux travaux sur la question des générations dites spontanées. Par M. A. de Bary." Ann. d. Sc. sér. 4. t. xx.

ceeds to describe the production by the oospores (or impregnated contents of the oogonia) of active zoospores, similar to those produced by the ordinary spores of *Cystopus*. Dr. de Bary states that these zoospores, after remaining active for three or four hours, lose their cilia and power of motion, assume a cellulose covering, and germinate. He adds that the germ-filaments enter readily by the stomates and leaves of the nutrient plant, but that those filaments only become developed which *enter the stomates of cotyledons*. In *Peronospora* the development of the antheridia, oogonia, and oospores is said by De Bary to be the same as in *Cystopus*; and he gives particulars of the mode of germination of the conidia, and remarks on the growth of the parasite, which can only be studied in detail in the paper itself.

The most interesting part of the paper is that which contains the observations on *Uromyces appendiculatus*. The mode of germination of the spores of this plant, the growth of the promycelium, and the production of the so-called sporidia are well known from Tulasne's account*, published long since in the *Annales des Sciences Naturelles*. De Bary has followed the process in its subsequent stages. According to his observations, the sporidia produce a mycelium, from which spring in succession—1st, spermogonia; 2ndly, peridia, producing chains of orange-coloured fruit (or, in other words, an *Æcidium*); and 3rdly, the original fruit of *Uromyces*, accompanied by the more simple fruit formerly called *Uredo*, and now called *Uredo*-stylospores. The germination of the *Æcidium*-stylospores (*i. e.* the fruit produced by the peridia), as well as that of the *Uredo*-stylospores, produces, according to De Bary, 1st, *Uredo*-stylospores, and, 2ndly, the original *Uromyces*-spores. These results, if correct, are very singular. We find the *Uromyces*-spores passing through the generations of promycelium, sporidia, and mycelium,—the latter producing successively the two different products, spermogonia and æcidia, and ultimately the original fruit of *Uromyces*, accompanied by the *Uredo*. The spermatia (or contents of the spermogonia) never germinate; but we find the fruit of the æcidia, and also of the *Uredo*, reproducing, first the *Uredo* itself, and subsequently the original fruit of *Uromyces*.

Other interesting points noticed by De Bary are, that not only has each species of parasite a certain special nutrient plant, but it is probable that in certain Uredineæ with multiple fruit

* "Second Mémoire sur les Urédinées et les Ustilaginées," Ann. d. Sc. sér. 4. vol. ii. p. 77.

and alternate generations each sort of reproductive organ buries its germ in a different nutrient plant; the vegetation of the parasite is the sole cause of disease; there is no pretence for supposing that a morbid predisposition of the nutrient plant causes or favours the attack of the parasite, but, on the contrary, the more healthy a plant is, the more the parasite flourishes, if external conditions are favourable to it; that the parasitic diseases are contagious; and that the observations tending to show predisposition to attack have been made on perennial plants, and are explained by the fact that the mycelium imbedded in these plants is itself perennial.

The observations of M. Oersted, of Copenhagen, translated in the last part of the Journal of the Horticultural Society, are directed to prove the identity of *Podisoma Sabineæ* (the tremelloid fungus which grows on the branches of *Juniperus Sabina*) with *Ræstelia cancellata* (which attacks the leaves of pear-trees). His experiments have satisfied him that the two fungi in question are alternate generations of the same species; and the author adds that, from other experiments made by him upon *Æcidium Berberidis*, he has arrived at the conclusion that *Æcidium Berberidis* bears the same relation to *Puccinia Graminis* that *Ræstelia* does to *Podisoma* *. These observations are the more interesting from the fact of their having been made by M. Oersted without any knowledge of De Bary's investigations, which had contemporaneously led the latter writer to precisely the same conclusion (as to *Æcidium Berberidis*) as that arrived at by M. Oersted.

De Bary's observations on the connexion between *Æcidium Berberidis* and *Puccinia Graminis* are to be found in the Monatsberichte of the Berlin Academy for January 1865. He has carried out a series of careful experiments, which have satisfied him that the sporidia of *Puccinia Graminis* germinate on the leaves of *Berberis*, and that the *Æcidium* of the *Berberis* is a stage in the cycle of development of *Puccinia*. Thus, whilst in most Uredineæ the entire development is carried out upon one and the same nutrient plant, the alternate generations in *Puccinia Graminis* require a change of host. This (Dr. de Bary observes) is a peculiarity to be especially remarked. It is a state of things well known in the animal kingdom in the Tæniæ

* In the Reports of the Academy of Vienna, vol. li. p. 76, Reichardt describes as an *Æcidium* a plant from New Zealand which (he considers) forms an intermediate link between *Æcidium* and *Ræstelia*.

and Trematoda, but *Puccinia Graminis* is the first of the parasitic fungi in which it has been certainly ascertained.

Another interesting part of De Bary's paper is the full account which he gives of the different opinions as to the supposed injurious effect of the proximity of *Berberis* to corn—a notion very prevalent amongst agriculturists, whose views (although somewhat laughed at hitherto by scientific men) receive confirmation from De Bary's observations.

In the second and third volumes of the 'Selecta Fungorum Carologia,' by the brothers Tulasne, we have the completion of a work distinguished alike by the profoundness of its research and the beauty and accuracy of its illustrations. The different forms of fructification exhibited successively or contemporaneously by the same fungus had led to the formation of a host of spurious genera; and the present work contains a selection (from a number of observations) of cases in which the authors have traced the connexion between these different forms, and have succeeded in showing that many genera, such as *Hendersonia*, *Diplodia*, *Prosthenium*, &c. amongst the Coniomycetes, and *Helminthosporium*, *Macrosporium*, and others amongst the Hyphomycetes, are nothing more than imperfect or transitory stages in other genera of the great order of Sphæriacei. The observations are far too detailed and extensive to attempt to give any concise or cursory view of them; but it may be stated generally that the second volume treats of the three great groups of Xylariei, Valsei, and Sphæriei; whilst the third includes the Nectriei, besides the groups of the Phacidiei and Pezizei.

Besides the elimination of the groundless genera above referred to, it has been the object of the authors to define more accurately the numerous genera to which their observations relate; so that, in a classificatory as well as in a physiological point of view, the work is one of the utmost importance, and must be studied by all mycologists who would wish to obtain sound views upon the subjects to which it relates.

Some objections have been taken to the work being written in Latin, as less suitable than French for the present age; but this is hardly a reasonable complaint, although (as has been observed by an eminent German botanist) it is not obvious at first sight that "Horti Clodoaldenses" means St. Cloud, "Cavillæ Versaliorum" Chaville, &c. &c.

The nature of the organs called cystidia, which occur upon the gills of many of the Agaricini as well as upon *Boletus*, has been

a matter of discussion since the time of Micheli. Micheli, Bulliard, Klotzsch, and Corda all agreed in attributing sexual functions to them. Phœbus, in the 19th volume of the 'Nova Acta,' disputed this notion; and the question seems now to be set at rest by the observations of M. de Seynes in his recent work, 'Essai d'une Flore mycologique de la région de Montpellier et du Gard.' The conclusion at which M. de Seynes arrives is, that these cystidia are nothing more than organs remitted to vegetative functions by a sort of hypertrophy—that they are in fact basidia which, having become hypertrophied, have resumed the character of vegetative organs, as one sees abnormally a carpel become a leaf.

In a paper* published in the 'Botanische Zeitung' for August 26, 1864, M. Sollmann has attempted to show that in certain species of *Nectria* a process of impregnation takes place similar to that which has been noticed in *Fucus*, *Sphaeroplea*, *Vaucheria*, and other kinds of Algæ, viz. by the incorporation of spermatia with the young spores. Much doubt has been thrown upon these observations by the subsequent remarks of Professor Janowitsch in the *Botanische Zeitung* for May 12, 1865 †, who maintains not only that the so-called spermatia are not impregnative bodies and do not amalgamate with the spores, but that they in fact originate from the spores themselves, being the product of the germination of the latter. M. Sollmann's theory would no doubt require a considerable amount of confirmatory evidence before mycologists would be willing to accept it; but, on the other hand, it is almost equally difficult to admit M. Janowitsch's suggestion, that the occurrence within the ascus of the bodies called by Sollmann spermatia (as observed by Mr. Berkeley and by De Notaris) is to be explained by reference to the process of germination.

The cause of the disease known as "Spot" in Orchids, of which several different kinds have been noticed by cultivators, has been traced by Mr. Berkeley, in one instance, to the occurrence of a minute parasitic fungus belonging to the genus *Leptothyrium*. A description of the disease, with excellent illustrations, giving the general appearance of the diseased leaves and a magnified figure of the parasite, has been given by Mr. Berkeley in the 1st part of the new series of the *Journal of the Horticultural Society*.

* "Beiträge zur Anatomie und Physiologie der Sphæriaceen," von August Sollmann.

† "Ueber die Entwicklung der Fructifications-Organe von *Nectria*," von Alexis Janowitsch.

De Bary's 'Beiträge zur Morphologie und Physiologie der Pilze,' of which two parts have been published in a separate form (in the second of which he was assisted by M. Woronin), appeared first in the Transactions of the Senckenberg Natural-History Society. The first part contains observations on the genera *Protomyces*, *Physoderma*, *Exoascus*, *Phallus*, and *Syzygites*. The most interesting facts noticed in *Protomyces* are the hybernation of the sporangia, and the copulation of the spores. Although some few of the sporangia may germinate in the summer, by far the greater number pass the summer without change, and, remaining unchanged during the winter, do not commence growth until the spring. They have great capacity for resisting cold; for in the neighbourhood of Freiburg in the winter of 1860-61, when the temperature in January often fell below zero of Fahrenheit, with hardly any snow, the sporangia which had been exposed during the winter germinated freely in the spring. Soon after the ejection of the spores from the sporangia, they were seen to unite in pairs, in the manner long since observed to occur in the spores of *Tilletia*. *Exoascus* is the name given by Fuckel, in his 'Enumeratio Fungorum Nassoviæ,' to the fungus which causes the strange disease which occurs in different species of *Prunus*. The disease is common in some parts of Europe; it causes a monstrous enlargement of the unripe fruit; and the Germans have a variety of names for it (Taschen, Schoten, Norren, Hungerzwetschen). Dr. de Bary describes and figures the different stages of the fungus, and concludes that it is the primary cause of the disease in question. He is of opinion that those authors who attribute the disease to the effect of weather happen only to have observed its occurrence in unfavourable seasons, and have hastily concluded that the weather was the cause, whereas more extended observation would have shown them that it occurs in all seasons. With regard to the systematic position of *Exoascus*, De Bary thinks it a true Discomycete, and ingeniously suggests that it bears the same relation to *Helvella*, *Spathulea*, &c. as *Sphæria typhina* does to the larger species of *Cordyceps*. The genus *Exoascus* is perhaps unnecessary; for (as Hoffman has suggested) the plant described by De Bary does not seem to differ from *Ascomyces deformans* of Mont. & Drom.

The observations on the Phalloideæ do not call for any special remark; and those on *Syzygites* are shortly to the effect that the plant is a Hyphomycetous fungus with double fructification, the

one form being the spores produced by copulation (zygospores), the other the asexual fruit or spores proper. The latter are produced in large cells at the apex of the threads, as in the genus *Mucor*. The threads with the mucoriniform fruit have been described by Link as a distinct fungus, under the name of *Sporodinia grandis*.

The second part of the "Beiträge zur Morphologie und Physiologie der Pilze"*, produced conjointly by MM. de Bary and Woronin, contains observations upon *Ascobolus*, *Mucor*, and *Peronospora*. The general remarks upon the development of *Ascobolus pulcherrimus* are too detailed to be referred to at any length; but it is worthy of remark that M. Woronin has discovered, in the early stages of growth, the formation of a peculiar cellular body, and the attachment to it of other cells, thrown out from the neighbouring mycelium, quite analogous to what has been before observed by De Bary in the case of *Erysiphe*; and he states that he has seen the same process (which may possibly be a process of impregnation) occur in the early stages of *Peziza scutellata* and *Peziza granulata*. A very interesting fact, noticed for the first time by M. Woronin, is the occurrence on the mycelium of *Ascobolus pulcherrimus* of resting spores, which, after being thoroughly dried and passing the winter in a state of quiescence, germinate freely on the application of moisture in the spring.

The observations on *Mucor Mucedo* are directed to show that the common mould which goes by this name has three, if not four, different forms of fruit; and the authors have satisfied themselves that the mould called *Thamnidium* by Link (but which is better known under Corda's name of *Ascophora elegans*) and the mould described by Messrs. Berkeley and Broome as *Botrytis Jonesii* (which is made into a new genus by Fresenius, under the name of *Chaetocladium*) are only varieties of the fruit of *Mucor Mucedo*. The authors have been unable to verify Bail's statements as to the identity of *Mucor Mucedo* with yeast, *Achlya*, *Saprolegnia*, and *Entomophthora* (or *Empusa*), although they confirm that writer's opinion as to *Entomophthora* being only a stage in the development of *Achlya prolifera*. In *Mucor stolonifer* MM. de Bary and Woronin have discovered the existence of a second form of fruit, viz. zygospores produced by the copulation of two cells in a manner precisely similar to what takes place in *Syzygites*. They seem premature in assuming the probability of the occurrence

* Abhandl. d. Senckenb. naturf. Gesellschaft, V. Bd. (printed separately).

of zygospores in all the species of Mucorini; but they are perhaps justified in transferring *Syzygites* to *Mucor*, under the name of *Mucor Syzygites*. Some useful remarks are appended as to the necessity of a large reduction of the genera of the Mucorini; and it is suggested that the arrangement of the species must remain in suspense, starting with six well-defined ones, viz. *Mucor Syzygites*, *M. Mucedo*, *M. Phycomyces*, *M. macrocarpus*, and *M. fusiger*.

The rest of the paper under consideration relates to a peculiar mode of development of the conidia of *Peronospora infestans* (the Potato-disease fungus), and to the germination of the oospores of *P. Valerianellæ*, which have been observed to produce germ filaments similar to the mycelium of the species, and not to yield zoospores.

To those mycologists who are particularly engaged in the study of the Discomycetes may be recommended a pamphlet published at Genoa in 1864, by M. de Notaris, under the title "Proposte di alcune rettificazioni al profilo dei Discomiceti." The author is of opinion that the genera of this large division, defined, as he says, by Fries in the 'Summa Vegetabilium Scandinaviæ' *con singolare perizia*, required to be reconsidered with reference to the light thrown upon the group by recent investigations.

A fourth number of Hoffmann's 'Icones Analyticæ Fungorum,' a work devoted to the development and minute anatomy of fungi, has just been published.

The effect of fungi in the production of cutaneous disease is a question upon which recent investigations afford very little satisfactory evidence. The hopelessly irreconcilable opinions of the best French and English authorities lead only to the conclusion that either one side or the other has a very imperfect notion of the causes of the diseases committed to their care. The fearful complaint (not belonging to the cutaneous class) known as the fungus-foot of India, has been the subject of careful investigation by Dr. H. J. Carter, Dr. H. V. Carter, and Mr. Berkeley; and the results of their inquiries will be found condensed in a short but very interesting paper, published in the 8th vol. of the Journal of the Linnean Society.

The use by the Russians of the well-known *Phallus impudicus* in medicine has been the subject of an interesting paper by Dr. Kaleniczenko, in the 25th vol. (p. 529) of the French periodical 'l'Union Médicale'*. The fungus is collected both in the young and mature condition. The gelatinous contents of the young

* "Observations pratiques sur l'action médicale du Champignon *Phallus impudicus* (Dziabka) dans certaines maladies de l'homme."

volva are extracted and made into a sort of ointment, which is called "earth-butter," or "earth-oil" (*Zemlianoë maslo*); and this is used for external application. The ripe fungus is dried in an oven, or in the sun, and then powdered, and the powder (which retains the offensive smell of the fresh fungus) is made into an infusion with water or alcohol. This mixture, which produces the most powerful effect upon the human body, is used as a remedy for gout and rheumatism, for periostitis, and for abdominal dropsy after chronic intermittent fever. The medical properties of this fungus having been hitherto quite unknown, the subject deserves the attention of the profession.

In Geographical Botany, since I mentioned the subject in my Address of 1863, there have been a few papers, chiefly upon local distribution as affected by climatological and other physical causes, of which the most interesting are those drawn up by observers of the vegetation of mountainous regions or of high latitudes. Amongst these I may mention several papers by Ruprecht and by Midden-dorff and others, in the Petersburg Transactions and in the Moscow Bulletin, including Ruprecht's researches into the origin of the *Tchernozem*, or black soil of the south of Russia; Baker's 'Flora of North Yorkshire,' and especially Heer's opening Address to the Meeting of 1864 of the Société Helvétique des Sciences Naturelles. The general subject is, I hope, likely to be again taken up by the distinguished author of the 'Géographie Botanique.' I understand that the stock of that work is nearly exhausted, and that M. de Candolle has in contemplation either a new edition or a remodelling of the work in a more compact form. There is indeed a great deal of minute detail which was very essential for establishing the general facts commented upon, but which, having thus been once recorded in a book very generally dispersed and deposited in accessible libraries, would not need repetition, and might be made to give place for a digest of the additional facts recorded. Greater extent would also naturally be now given to the development of the history of the migration of species, independently of climatological causes, towards which a considerable mass of data has been collected since the first edition. I would venture particularly to call the author's attention to that apparent general tendency of species to travel from east to west rather than from west to east, to which I alluded in 1863; to the inquiry whether there is any connexion between this tendency and the great accumulation and diversity of species of limited areas at the western and, especially, south-western extremities of great con-

tinents, such as South-west Europe, the Cape district, South-west Australia, Chile, and Mexico; to the investigation of the close connexion, in many respects, between the high northern and extreme southern floras, rendered still more striking by the number of species found of late years in the newly explored mountains of Victoria and Tasmania, either absolutely identical with or scarcely to be distinguished from European forms; to the comparative distribution of plants and of insects, whose existences are so closely dependent on each other—to the discussion, for instance, of how far the speculations of Wallace, founded on the distribution of Polynesian insects, are or are not confirmed by that of the vegetation of those islands.

Vegetable Physiology, in all its branches, has much occupied the attention of continental observers, both in France and Germany, and more especially in the latter country; and many are the observations, throwing new lights on the history of vegetable life and structures, recorded in the Transactions and Journals of both countries. It is, however, unnecessary, for the present at least, to devote our time to the searching them out from the enormous mass of writing in which they are buried; for a general digest, of excellent promise, has been commenced by several eminent German physiologists under the guidance of Hofmeister. Of this work, entitled "*Handbuch der physiologischen Botanik*," and intended to be complete in four octavo volumes, the fourth (by Julius Sachs) and the first half of the second (by De Bary) have reached us within the last few days; both are, however, dated some months back. As far as can be judged from a rapid glance, this work appears to give a remarkably clear and methodical exposition of subjects which are now become most complicated. In De Bary's half volume, Fungi are treated of, in four parts:—1. Morphology, or structure; 2. Reproduction, asexual or sexual; 3. Development, including Pleomorphism and Metamorphism; and 4. Physiological Peculiarities, including their requirements for production and nutriment, the influence upon them of external physical causes, and the effects of their own action upon the substrata on which they live. A similar arrangement of the subject is then followed for Lichens; and a shorter chapter at the end is devoted to Myxomycetæ.

Julius Sachs's volume is entitled "*Handbook of the Experimental Physiology of Plants; or, Researches into the most general Life-requirements of Plants, and the Functions of their Organs*." Fertilization of plants is, however, excluded from this volume, as it is to form the subject of one of the previous ones not yet pub-

lished. The present author divides his subject into thirteen treatises, of which the first five are devoted to the effects of light, heat, electricity, gravity, and chemical elements respectively upon plants. We then come to the absorption of nutritive elements, the circulation of fluids, followed by that of gases, through plants, the influence of atmospheric oxygen, the metamorphosis and movements of the substances out of which the organic cells are formed, the molecular structure of organic cells, and, lastly, the tension of vegetable tissue from mechanical and other causes. To the advantages of this apparently exhaustive distribution of the subject must be added that of excellent typographical arrangements. A line or two at the commencement of each section, in an open type, indicates the subject of the section; the ordinary type gives the essential points; and corroborative and argumentative details follow in a smaller type, which, for ordinary consultation, may be passed over.

It is announced that the whole work is to be completed during the present year. The first volume is to contain the plant-cell and the general morphology of organs by Hofmeister, the succession of buds by Irmisch, and the anatomy of organs of vegetation in vascular plants by De Bary. The second, Cryptogamic volume is to be completed by Pringsheim on Algæ, and Hofmeister on Mosses and vascular Cryptogams. The third is to be devoted to sexual reproduction, by Hofmeister. If this plan be as well carried out to the end as it has been commenced, it will supply one of the greatest wants in the present state of our science: but so active are the researches now made, that even the volume so recently published requires supplementing. The curious observations of Charles Darwin, published in our own Journal, on tendrils and climbing plants, had not yet reached Germany, and would make important additions to Julius Sachs's last chapter. An important paper, also read at one of our recent meetings by a distinguished philosopher who is not one of us or of our science, Mr. Herbert Spencer, seemed to throw a new light upon some of the effects of physical causes in promoting phenomena of vegetable life. This paper, however, being in the printer's hands, I have not yet been able to study it, and therefore refrain from giving expression to any considerations that the hearing it read in extract may have suggested. I can only express a hope that the ingenuity he has shown in conducting some experiments on the circulation of imbibed liquids, may be further applied to the clearing up of some of the numerous still-hidden mysteries of vegetable life.

OBITUARY NOTICES.

The Secretary then read the following Notices of deceased Members:—

On the present occasion the Linnean Society has to deplore the loss by death of an unusual number of its Members, including no less than eighteen Fellows, one Foreign Member, and two Associates.

And not only is the melancholy list numerically large, but it is also extraordinarily heavy in containing the names of some of the most distinguished of modern naturalists.

Botanists will find in it the names of Hooker, Harvey, Lindley, and Montagne, whilst Zoologists have to lament the loss of Richardson, Woodward, Reeve, and Cuming.

Such losses in so brief a space have seldom, if ever, been recorded,—certainly not in the annals of this Society; and our regret is deepened by the consideration, that although some of those whose loss we deplore may well be deemed to have done their work and to have died in the full enjoyment of a well-earned fame, others have been cut off in full activity, from whom the most important contributions to science might have been expected for many years to come.

Richard Dykes Alexander, Esq., was born at Ipswich on the 15th of August, 1788, and died on the 23rd of December last. He became a Fellow of this Society on the 2nd of April, 1822.

He was the eldest son of the late Mr. Dykes Alexander, banker, of Ipswich, in which town he passed the whole of his life. Admitted at a very early age a partner in his father's bank, his delicate health obliged him at the age of 40 to resign his partnership, and he retired, satisfied with a moderate independence, to devote his time, his money, and his powers to the duties of the Society of Friends, of which he was a most distinguished member, and to the prosecution of every good work amongst his fellow townsmen. As an instance of his great zeal in all works of charity, it may be mentioned that at one time, finding the medical wants of the poor were sadly neglected, he entered upon the study, and acquired a very respectable knowledge of medicine and surgery,—a knowledge which he put to practical use by opening a dispensary of his own, where with generous kindness he afforded relief for many years to numerous sufferers; and in addition to this, the East Suffolk Hospital was largely indebted to him for its erection and support.

He also built the convenient and spacious Temperance Hall at Ipswich entirely at his own cost; and was during his whole life an ardent, enthusiastic, and consistent advocate of the temperance movement.

Heinrich Barth, one of the most distinguished in the illustrious host of African explorers, was born at Hamburg on the 16th of February, 1821, and died at Berlin on the 25th of November, 1865.

At a very early age Dr. Barth appears to have set before himself, as the object of his life, the investigation of the history of the course of ancient commerce and civilization amongst the nations inhabiting the Mediterranean basin. With this view he devoted himself with extreme assiduity to classical and historical studies, and to that of modern languages, in the acquirement of which he enjoyed the utmost facility.

Well versed in classical and modern philology, he proceeded to the University of Berlin in 1839, where his studies were continued under the guidance of Lachmann, Zumpt, and other distinguished scholars; and where also he was fortunate enough to attend the lectures of Carl Ritter on geography. Unfortunately, however, he seems never to have had any taste for natural-history studies, his deficiency in which he often had reason in after years so deeply to lament.

In 1840 he visited the Alps and the whole length of the Apennine ridge, the south of Italy, and Sicily, his attention being chiefly directed to the subject I have above adverted to; and the first fruits of his observations respecting it appeared in his Inaugural Thesis in 1844, entitled "*Corinthiorum Commercii et Mercaturæ historiæ particula.*"

Having completed his academical course, Barth in the year 1845 set out upon his long projected travels in the countries adjoining the Mediterranean. But as a preliminary step he came to London, in order to study the remains of ancient art in the British Museum, and also to learn Arabic. From London he proceeded to Paris, and subsequently through France and Spain to Gibraltar, where his actual labours were to commence.

His intention appears to have been to traverse the northern part of the African continent from west to east, but finding it impossible to pass through Morocco, he was compelled to return to Spain and thence proceeded to Algiers. At this early period of the French occupation of the country he was again prevented following the land route he would otherwise have taken, and he went by sea to Tunis, whence he made his way to the sites of

Carthage, Utica, and other ancient towns; but before reaching Egypt he was so unfortunate as to be attacked by robbers, from whom he barely escaped with his life, and with the entire loss of his collections, notes, and drawings, including numerous copies of inscriptions. He reached Alexandria, however, on the 17th of June, after enduring extreme hardships.

Notwithstanding the almost complete loss of his papers, Dr. Barth's accurate memory, with the aid of letters he had written to friends during the course of his journey, enabled him to publish some account of it in 1848, under the title of 'Wanderings in the Coast-lands of the Mediterranean.'

Nothing discouraged by the sufferings he had undergone, Dr. Barth, after a very short stay at home, again started in the prosecution of his design. Proceeding in the first instance to Cairo, he ascended the Nile to Assouan, where he arrived in October 1846, and from thence visited the ruins of Berenice on the Red Sea by a hitherto untrodden route, and thence returned by Cosseir and Tor to Cairo; from whence he proceeded to Gaza, and after a prolonged journey through Palestine and Syria, continued his route through Asia Minor to Constantinople, and after visiting Greece reached his father's house again in December 1847.

After a brief repose he began to prepare himself for the duties of Professor of Geography in the University of Berlin, where he commenced his lectures in 1849.

He was not successful, however, as a teacher, and his course terminated after a few discourses. His labours were to be bestowed in another direction.

In the autumn of 1849 the English Government determined upon sending an expedition to Bornou, in the interior of Africa, with a view to the promotion of commerce and the abolition of the slave trade. The expedition was placed under the command of Mr. James Richardson, with whom were associated Dr. Barth and his fellow countryman Dr. Overweg.

Starting from England in the middle of November, the two Germans reached Tripoli on the 11th of December, where they were joined by Richardson a few days later; but the expedition did not quit Tripoli till the following March. Traversing the Sahara, with considerable risk and occasional suffering, it reached the city of Tintellust, the capital of the kingdom of Air, in September, and Soudan in the month of November. There the expedition, long distracted by divided views and incompatibilities of character, appears to have been broken up, the three members of

which it was composed starting in different directions, with the understanding that they were to meet again at Kukaua in April. Richardson, however, died on the 4th of March, and Barth assumed charge of the mission. Under great difficulties, chiefly arising from want of means, Barth had reached Katsena in February, and Kano, the principal city of the most populous province of the great Fellahah kingdom. There his funds entirely failed; but with the aid of a small loan from the governor of the town he started on his return to Kukaua, which place he reached in April, and where he was joined in the following month by Dr. Overweg. With money again borrowed from the governor, Barth was able to discharge Richardson's servants; and whilst waiting the determination of the British Government with respect to the future destination and direction of the mission, he and his companion employed their time on an expedition to the Lake Tchad and the country of Adamana. It was on this expedition that Dr. Barth discovered the upper stream of the Benue, and thus made known the great water route from the centre of Africa to the Atlantic Ocean. After a visit to the kingdom of Baghirmi, Dr. Barth, on his return to Kukaua, received the required authorization of the British Government, with instructions, at the same time, to relinquish the originally projected route across the equatorial zone of the African continent to the south-east coast, and to make his way westwards to Timbuctoo and the Atlantic shores instead. Shortly afterwards Dr. Overweg died at Kukaua, and Dr. Barth was left alone to pursue his perilous and unknown course to the mysterious "Queen of the West." He lost no time, however, in setting out, and on the 25th of November was on his way towards the Niger, which he reached and crossed near Say on the 20th of June, 1853. Thence directing his march in a north-west direction, through wholly unknown countries, he entered Timbuctoo on the 7th of September, 1853, where he was detained, it may be said a prisoner, for nine months, leaving it on the 11th of May, 1854, on his return homewards. On his route he was fortunate enough to fall in with Dr. Vögel, who was then on his adventurous and fatal journey to the south. Gaining the first sight of the Mediterranean on the 2nd of August, Dr. Barth reached Berlin on the 13th of October, after nearly six years' travel, performed under the greatest dangers and privations, and pursued with the most indomitable perseverance and undaunted courage.

Besides the important geographical results of these labours,

which it would be out of place here to detail, Dr. Barth brought home the most abundant and interesting linguistic and ethnographical materials; and it is only to be regretted that his defective acquaintance with the natural-history sciences should have prevented his adding equally to those important and to us even more interesting branches of knowledge.

The years succeeding his return to Europe were devoted to the preparation of the Account of his African Explorations, which was published simultaneously in German and English in 1857, both versions being the work of his own hand.

The remainder of his life was spent alternately in Hamburg, London, and Berlin, the latter city being his final place of abode.

The publication of his work completed, the still untired energy of Dr. Barth again led him to continue his Mediterranean researches; and with this view he made two journeys,—one in 1862, and the other in 1865. The former was devoted to the exploration of the Danubian provinces and Greece, and the second to Dalmatia and the districts to the east of the Adriatic,—thus completing the entire circuit of the Mediterranean basin, and fulfilling the object which he had placed before himself at the outset of his adventurous life.

Mr. Black was born in 1832, we believe at Forres, in Morayshire, and was from his youth attached to horticulture and botany. He served his apprenticeship under Messrs. Henderson of Dunkeld, where he displayed so much knowledge and enthusiasm in botanical pursuits as led to his being recommended to the notice of the late Sir William Hooker, who selected him for the office of curator of his herbarium in the year 1853, and by whom he was held in the highest regard and esteem during the remainder of his life. Mr. Black retained the office until 1864, when, owing to the failure of his health, he was obliged to seek a warmer climate. The post of Superintendent of the Bangalore Gardens falling vacant at that time, he was recommended by Sir William to fill it; he was appointed immediately on his arrival in India, and fulfilled the duties most ably, until a few weeks before his death. Though his health at first improved, his disease (pulmonary consumption) was not conquered; and he suffered so much during last summer and autumn, that at the urgent desire of his friends he was induced to obtain two months' leave of absence, and to undertake a sea voyage, in the forlorn hope of warding off its consequences. With this object he embarked for Rangoon in November last, on a visit to a brother who was resident there; he

landed in a most precarious state, and, acting under medical advice, he went to sea again, accompanied this time by his brother, on a trip to the Andaman Islands. Four days after embarking his disease terminated fatally, and he was buried on the 5th of December on Table Island, one of the Cocos group, immediately north of the Andamans, in the midst of a tropical vegetation of the utmost luxuriance and beauty. Mr. Black's decease will be greatly regretted by a very large circle both of British and foreign botanists, by all of whom he was most highly valued, not only for the many services he rendered to them, but for the simplicity of his manners, his amiable disposition, and his truly estimable character. His modesty prevented his ever becoming an author, but many botanical works owe much of their value to his industry and knowledge; and at Sir William Hooker's request he drew up a catalogue of the 'Flora of Japan,' which appeared under his own name in Hodgson's 'Japan,' and of which many copies were distributed by his patron in a separate form.

Hugh Cuming, Esq., F.R.S., died on the 10th of August, 1865. He was born at West Alvington, near Kingsbridge, in Devonshire, on the 14th of February, 1791. Remarkable even as a child for his love of plants and shells, the latter taste more especially was largely fostered and developed under the patronage of Colonel Montagu, who resided in the neighbourhood.

Apprenticed to a sail-maker, he was necessarily brought into contact with seafaring men; and in 1819 he made a voyage to South America, and settled at Valparaiso. Here his passion for collecting shells found ample field for its gratification, and was greatly stimulated by the English Consul, Mr. Nugent, and by several officers of the British Navy, and especially by those in the surveying ships under Captains King and Fitzroy. In fact, in 1826, he gave up his business in order wholly to devote himself to his favourite pursuit. With this object he built a yacht, expressly fitted for the collection and stowage of objects of natural history, and a cruise of upwards of twelve months among the islands of the South Pacific amply rewarded him for his toils in dredging and collecting by sea and on shore. On his return to Valparaiso he prepared for a voyage of greater extent, on which he started under peculiar advantages. The Chilian Government granted him the privilege of anchoring in its ports free of charges, and of purchasing stores free of duty; and he was also furnished with letters to the authorities of all the states he visited. After two years spent in exploring the coast from the Island of Chiloe to the Gulf of Con-

chagua, dredging in all the bays and inlets, searching among the rocks and stones at low water, and inland in the plains, river-banks, and forests, Mr. Cuming returned to England with an enormous accumulation of natural-history objects of all kinds. The most important part, however, was the conchological. In 1835 Mr. Cuming undertook a new expedition to the Philippine Islands, a region rich in natural productions, and but little explored, and where his familiar knowledge of the Spanish language and manners would be of great advantage. Here, although dredgings on the shores were not neglected, his attention was more particularly directed to the woods and forests, where he reaped a most abundant harvest of plants, and collected such an immense and magnificent series of land-shells as had never before rewarded the exertions of a collector. In every place Mr. Cuming was the guest of the priest, always the chief personage in the interior of these islands, and by whom he was always assisted in every imaginable way. He was also thus enabled to obtain what was of still greater importance, the services of the children educated in the public schools, and numbering in some places as many as 400 or 500. By the aid of these sharp-eyed auxiliaries, shells which gladdened his eyes by their novelty and exceeding beauty were daily brought to him in prodigious numbers.

After four years spent among these islands, and in short visits to Malacca, Singapore, and St. Helena, Mr. Cuming returned to England with the richest booty ever collected by a single man. His dried plants, which numbered 130,000 specimens, were immediately distributed, as well as his living Orchids, which were numerous and of great beauty. Large numbers of Birds and Reptiles, Quadrupeds and Insects, were added to museums at home and abroad. But the shells formed by far the most important part of his collections. Before leaving England he had brought together from his own American collections and elsewhere the largest and most valuable collection then in existence. By his vast Philippine collections this was increased to an enormous extent; and during the twenty-five years that have since elapsed he was untiringly engaged in its arrangement, completion, and description by various conchologists. It is stated to have contained not less than 30,000 species and varieties, and in most cases several specimens of each.

From time to time he disposed of his duplicate specimens to various public and private collections, and always took pleasure in

acknowledging that his expenses and labours had been amply repaid.

"The great object of my ambition," he said in 1858, "is to place my collection in the British Museum that it may be accessible to all the scientific world, and where it would afford to the public eye a striking example of what has been done by the personal industry and means of one man."

This worthy object has been obtained, and the British Museum has since his death purchased this unrivalled collection, and placed it where its founder's wishes desired it to be.

The Linnean Society, also, owes a special debt of gratitude to Mr. Cuming, who several years since presented to our Library his extensive collection of Conchological Works, into possession of which we have now entered.

William Freeman Daniell, M.D., F.R.C.S., Staff-Surgeon in the Army, was born, I believe, at Liverpool, in the year 1818, so that, having died on the 26th of June last, he would have been forty-seven years of age at the time of his death. In 1841 he became a Member of the Royal College of Surgeons of England, and shortly afterwards entered the medical department of Her Majesty's Army. He then served the whole of his time as Assistant-Surgeon on the pestilential coast of West Africa, and obtained his promotion to the rank of Staff-Surgeon on his return to England in 1853. About this period he was elected Honorary Member of the Pharmaceutical Society. He afterwards proceeded to the West Indies, where he served for some years. In 1855 he was elected a Fellow of the Linnean Society; and in 1857 a Fellow of the Royal College of Surgeons of England. In 1860 he accompanied the "Expeditionary Force" to China, and was present at the taking of Pekin. A short time after his return to England from China he went to the West Indies, and returned from Jamaica in September last, with his constitution completely broken up by the climate and by his devotion to scientific studies; and though he rallied to some extent for a short period, no hopes were entertained of his ultimate recovery, and he died, after a long and painful illness, at Southampton in June last. He was buried at Kensal Green on July 3rd. Dr. Daniell was a valuable contributor to the Museum and 'Journal of the Pharmaceutical Society.' His first contribution to the 'Journal' was in February 1850, "On the D'Amba, or Dakka, of South Africa;" followed by papers "On Zea Mays and other Cerealia of West Africa;" "*Synsepalum dulciferum*, or Miraculous Berry of West Africa;" "*Sansevieria*

guineensis, or African Hemp ;" "*Pterocarpus erinaceus*, or Kino-tree of West Africa ;" " Katemfa, or the Miraculous Fruit of Soudan ;" " Ethiopian, or Monkey Pepper ;" "*Cubeba Clusii* of Miguel, the Black Pepper of West Africa ;" " Frankincense-tree of West Africa ; Amoma of West Africa ;" " Egusé Oil, a new Vegetable Product from West Africa ;" "*Cæloclyne polycarpa*, the Beberine, or Yellow Dye-tree of Soudan ;" " Copals of West Africa ;" " Red Canella Bark from the West Indies ;" " African Turmeric ;" " The *Cascarilla* and other species of Crotons of the Bahama and West India Islands ;" " Kola Nut of Tropical West Africa," &c. Many of the specimens described in the above-mentioned papers were afterwards presented to the Museum of the Pharmaceutical Society.

The many specimens which Dr. Daniell brought to this country also furnished materials for valuable papers by Mr. Bennett, Mr. Carruthers, and other botanists. Among these may be mentioned, 1. "Description of the Kobo-tree (*Guibourtia copallifera*, Ben.), a new genus of *Leguminosæ*, collected by Dr. Daniell in Sierra Leone" (Journal of the Linnean Society, vol. i.) ; 2. "Note on the Species of *Croton* described by Linnæus under the names of *Clutia Eleuteria* and *Clutia Cascarilla*" (ib. vol. iv.), both by Mr. Bennett, who, in commencing the latter paper, thus speaks of his obligations to Dr. Daniell :—"During a late residence in the Bahama Islands, the attention of our indefatigable Member, Dr. Daniell, was especially directed to the species of *Croton* growing in those islands ; and I am enabled, by his kind communication of the specimens collected by him, to clear up much of the obscurity in which the species furnishing the Cascarilla barks of commerce have been involved." 3. "On some species of Oaks from Northern China, collected by W. F. Daniell, M.D., F.L.S.," by William Carruthers, Esq., F.L.S. (ib. vol. vi.).

A species of *Anomum* from Western Africa was named in honour of him in 1852 by Dr. Hooker (Journ. Bot. vol. iv. p. 129).

Dr. Daniell was a Fellow of the Royal Geographical Society, and was a contributor to the Journal of that Society, as well as to the Proceedings of other Societies, and to several periodicals. He was also well acquainted with the native languages* of many of the African tribes, and is said to have had some knowledge of Arabic ; and in 1849 he published a volume on the 'Medical Topography and Native Diseases of the Gulf of Guinea.' This work is

* During the last few months of his life he was much occupied with a dictionary (?) of the Burbur language, which he did not live to publish. .

highly spoken of by those competent to form an opinion on the subject.

From the above summary it may be seen that Dr. Daniell was indefatigable in his labours and researches while on service abroad and at home, and we can now only deplore that one who had not only enlarged the boundaries of science himself, but had also enabled others to do the same, has been removed from us at such an early age. (*Pharmaceutical Journal*, No. 74, slightly condensed, and with some additions in reference to our own Journal.)

Joseph Dickinson, Esq., M.A., M.D., F.R.S. Died on the 26th of July, 1865.

The following excellent memoir of Dr. Harvey is abridged from the 'Gardener's Chronicle,' June 9th, 1866:—

"*William Henry Harvey, M.D., F.R.S., M.R.I.A.*, Professor of Botany in the University of Dublin, &c., &c., was born of Quaker parents on the 5th February, 1811, at Summerville, near Limerick, the residence of his father Joseph M. Harvey, for many years a highly respected and influential merchant in that city.

"From a very early period he manifested an ardent love of plants; and the fact of his father's family frequently spending a portion of the summer at the sea-side, generally at Miltown Malbay, on the coast of Clare, Ireland, afforded him great opportunity for the indulgence of his taste for natural history. This bold and picturesque coast, open to the mighty roll of the Atlantic, abounded in those marine plants which in after life became his special study. The rudiments of knowledge then acquired resulted in forming him some years later into the most eminent Algologist of his day.

"In the year 1824 he was sent to Ballitore School, in the county of Kildare, then conducted by Mr. James White, a man of talent and learning, who encouraged young Harvey in his tastes and pursuits, giving him at the same time an excellent general education.

"For some years after leaving school he was engaged in his father's house of business at Limerick, but natural history absorbed all his spare time and nearly all his energies. His holidays were devoted to excursions and collecting, and he rapidly acquired a thorough acquaintance with plants, especially the Algæ and Mosses of South-western Ireland, and made considerable advances in Entomology and Conchology. Interesting discoveries soon rewarded his exertions and stimulated his zeal. Amongst these one was of a new freshwater shell in the mountains of Killarney, and another of two new habitats for the rare and beautiful Moss,

Hookeria latevirens. This last discovery led, in 1831, first to a correspondence with the late Sir W. Hooker, and speedily to an attachment which amounted to filial affection for that illustrious and kindly patron of every aspiring botanist. Encouraged by Sir W. Hooker, he sought to devote himself exclusively to science, and made various attempts to obtain a situation or employment abroad that would have permitted of this. For several years this object was frustrated, and, indeed, was only eventually attained under the following singularly sorrowful circumstances. The late Lord Monteagle, then Mr. Spring Rice, a great friend of the Harvey family, had then in his gift the lucrative post of Colonial Treasurer of the Cape of Good Hope, which he intended to present to young Harvey; but unfortunately, by some accident, the appointment was made out in the name of his elder brother, a married man with a large family and thriving business: immediately after this, Mr. Rice, owing to a change of Ministry, retired from office. Great efforts were made to set the matter right with the succeeding Ministry, but in vain; and it was thought best for all parties that the elder brother should accept the appointment, and take the young botanist with him, and thus give him the opportunity of distinguishing himself in that rich field for botanical research. The brother, with his family and our friend, sailed in 1835, and had hardly got settled in the colony when the health of the former gave way suddenly, and it being obvious that he could never resume his duties, application was made at once that his brother should be appointed his successor, and take up the duties of his office on the spot. The answer not arriving, the whole party left the Cape for England early in 1836, when the brother died on the passage.

“On their arrival in England in June, 1836, Mr. Harvey found that his appointment as his brother's successor had already been sent to the Cape, and thither he followed it in August of the same year, and remained till 1839. During these three years he worked intensely hard at his office all day, but spent his mornings in collecting, and his nights at his books and microscopes, till his health breaking down he was compelled to return to Europe in May of that year.

“During this period, besides making many discoveries in flowering plants, Mosses, and Algæ, he sent home numerous papers illustrated by beautiful drawings and analyses of plants, which were published by Sir W. Hooker; and he found time to prepare and publish his excellent ‘Genera of South African Plants,’ the materials for which were all examined and redescribed by himself.

"In July, 1840, he sailed for the third time for the Cape of Good Hope, where intense application and over-exertion in botanical pursuits again brought on severe disease, and he was compelled to return to England in 1841, and ultimately to resign his colonial appointment.

"After this he appears to have spent a short time in his brother's house of business; but mercantile pursuits had never any charm for him, and in 1843 he became a candidate for the post of Keeper of the Herbarium of Trinity College, Dublin, vacant by the death of Coulter, the Californian and Mexican traveller; Harvey offering at the same time his beautiful herbarium, consisting of upwards of 10,000 species, to the College. The Professorship of Botany fell vacant at the same time, and the College having determined to unite the two offices, Harvey became a candidate for both, and in spite of powerful opposition, and the fact that a medical degree of the College was a *sine qua non*, he all but carried the day, the College having given him the honorary degree of M.D. to obviate this latter objection. After a good deal of debate it was at last settled that the Professorship should be separate from the Curatorship, the former being given to Dr. Allman, the present distinguished Professor of Natural History in Edinburgh, and the Curatorship to Dr. Harvey, with a salary of £150 per annum and rooms, an arrangement that perfectly satisfied, and indeed, as he said himself, pleased him.

"From this time forth his whole energies were devoted to the prosecution of botanical science. With characteristic conscientiousness he first set himself to arrange and distribute to scientific museums the collections of his predecessor, to arrange the herbarium, and make all ready for the furtherance of science. For several subsequent years he devoted himself chiefly to Algæ, and latterly, at the urgent desire of his friends at Kew, he undertook the 'Flora Capensis,' which occupied most of the latter years of his life.

"In 1847 he became a candidate for, and obtained, the Professorship of Botany in the Royal Dublin Society, vacant by the death of Dr. Litton, to whose modest merits he paid the kindly tribute of dedicating the beautiful South African plant, *Littonia modesta*. This office he continued to hold during his life under its correlative Institution the Museum of Irish Industry, subject to the direction of the Science and Art Department of the Committee of Privy Council on Education.

"In the year 1849 he received a joint invitation from the Smith-

sonian Institution at Washington and the Harvard University at Cambridge, U.S., to visit the United States, and under their auspices to deliver courses of botanical lectures at these and kindred institutions, and also to undertake the arrangement and classification of a large collection of plants in possession of the former. He complied with the proposal, and having performed these services, and visited Canada and the southern shores of Florida in pursuit of his favourite Algæ, he returned home in the year 1850, after an absence of about nine months, to resume his duties in the University of Dublin.

“His great zeal and enthusiasm inspiring him with a wish for a wider field of labour in pursuit of science, he applied to the University for liberty to make a voyage round the globe, chiefly with the object of making himself acquainted with marine plants in their native habitats, and to collect objects of natural history for the herbarium and museum of Trinity College. His wish was granted, and under the auspices of the University he started by the Indian mail in the year 1853 for Ceylon and Australia. He visited the east, south, and west coasts of Australia and Van Diemen's Land; and on his return from the latter to Sydney, finding that some Methodist missionaries were about to visit in the ‘John Wesley,’ a small vessel belonging to the mission, the various islands in the Southern Pacific, touching at New Zealand, he solicited liberty to accompany them, which was kindly granted, and in June 1855 they sailed for Auckland, the Feejee and Friendly Islands.

“From the Feejee Islands he returned to Sydney, whence he made a voyage to Valparaiso, where his health again gave way; thence he passed north, and crossed the Isthmus of Panama, returning by the West India Mail to England in October 1856, after having expended three years in this scientific voyage round the world.

“On his return to Dublin, in 1856, the Professorship of Botany became vacant through the appointment of his friend Dr. Allman to the chair of Zoology in the University of Edinburgh, and the post was conferred upon him and retained till his death.

“The following is a list of Dr. Harvey's principal works. It does not include the numerous papers communicated to various Botanical periodicals, and especially to ‘Hooker's Journal of Botany,’ Royal Irish Academy, Dublin Natural History Society, and sundry systematic works of his botanical correspondents and friends.

"In the year 1838 he prepared and published at the Cape of Good Hope his first important botanical work, 'The Genera of South African Plants.' The 'Manual of British Algæ' was brought out in London, 1841; the 'Phycologia Britannica' in 1846-51, 4 vols., and, in London, same years, in 3 vols.; 'Nereis Australis, or Algæ of the Southern Ocean,' London, 1847; 'The Sea-side Book,' London, 1849; 'Phycologia Australica,' London, 1858-63, 5 vols.; 'Flora Capensis, being a Systematic Description of the Plants of the Cape Colony, Caffraria, and Port Natal,' in conjunction with Dr. P. W. Sonder, Dublin, 1859 to 1865, vols. i. to iii.; 'Index Generum Algarum, or a Systematic Catalogue of the Genera of Algæ,' London, 1860; 'Nereis Boreali-Americana, or Contributions to a History of the Marine Algæ of North America,' contained in volumes iii., v., and x. of the Smithsonian Contributions to Knowledge, published in the United States in 1852." Dr. Harvey's only contribution to the publications of this Society is a "Notice of a Collection of Algæ made on the North-west Coast of North America, chiefly at Vancouver's Island, by David Lyall, M.D., R.N., in the years 1859-61" (Journal, vol. vi.).

General Sir John Bennett Hearsey, K.C.B., was a Cornet in 1808; he was present at the battle of Seetabuldie and at the siege and capture of Bhurtpore; in the Punjaub campaign of 1848-49 he was at Chilianwallah and Goojerat, and commanded the cavalry in the pursuit and at the final surrender of the Sikh army. He was several times wounded, and was made a K.C.B. for his services in the great mutiny of 1857. At that time he was in command of the Bengal division, with his headquarters at Barrackpore. Speaking of a chief of long standing in the service, "who to the cost of humanity was in charge of Meerut on that (first) day of evil omen," the Competition Wallah says, "Such a chief was *not* in charge of Barrackpore at the crisis, when foresight, calmness, and judicious severity broke up a battalion of murderous scoundrels, and saved the capital of India from the fate of Cawnpore. Hearsey at Meerut, Neill at Dinapore, and Outram at Allahabad might have saved much of the good blood that was spilled, and much of the bad blood that remained"*.

General Hearsey served fifty-three years in India, thirty-four of them without a furlough. He was a most zealous collector, and an untiring observer. It was to him and other officers in India that Professor Westwood was indebted for the materials of that

* Macmillan's Magazine, viii. p. 343.

splendid work, 'The Cabinet of Oriental Entomology.' He died in October last.

Sir W. Jackson Hooker, Knight of the Hanoverian Guelphic Order, and Companion of the Legion of Honour, Corresponding Member of the Institute, D.C.L., LL.D., F.R.S., F.G.S., &c., was born at Norwich, on the 6th of July, 1785, and died at Kew, after a short illness, on the 12th of August, 1865.

His father, a native of Exeter, was descended from the Secretary for Ireland whose name appears as a large contributor to Hollingshed's Chronicles, and was a member of the same family as Richard Hooker, the author of the 'Ecclesiastical Polity.' His son received his education at the High School of Norwich, under the tuition of the Rev. Dr. Foster. Having inherited, through his godfather, William Jackson, Esq., an ample competency in landed property, he determined to devote his life to travelling and to scientific pursuits. Being a keen sportsman, he formed a fine collection of the birds of Norfolk; and becoming very intimate with Messrs. Kirby and Spence, Alexander Mac-Leay, Esq., and other distinguished entomologists, he also devoted much of his attention to entomology. About this time he also became acquainted with Sir J. E. Smith, by whom he was encouraged to commence the study of botany—afterwards the main pursuit of his life. In 1806, when he came into possession of his estates, he seems to have given up everything for natural history. He made extensive botanical tours in the wildest parts of Scotland, accompanied, first, by Dawson Turner of Yarmouth, his future father-in-law, and afterwards by W. Borrer of Henfield, long the Nestor of English botanists. At this time also he resided much in London, where he made the acquaintance of Sir Joseph Banks, Robert Brown, Drs. Solander and Dryander, &c., and, indeed, of most of the distinguished scientific men of the day.

In 1809 he visited Iceland, which he extensively explored, making large collections in all branches of natural history; but these, together with all his notes and drawings, were totally lost on his way home, through the burning at sea of the ship of marque in which he was returning, and which was bringing Danish prisoners to England. An account of his almost miraculous escape, owing to the arrival of another vessel in mid ocean, will be found in the modest narrative called 'Recollections of Iceland.'

In 1810–11 he made considerable preparations for accompanying Sir Robert Brownrigg to the then little-known island of Ceylon,

of which Sir Robert was appointed Governor. For this purpose he sold his estates, the proceeds of which were invested in business and foreign securities, which, however, were unfortunately ill chosen, and afterwards much decreased in value. Of the zeal with which he carried on his preparations, we may give as an example the fact that he made pen-and-ink copies of the plates and descriptions of the entire MS. series of Roxburgh's Indian plants. His arrangements, however, all came to nothing, as the sanguinary disturbances which immediately afterwards took place in Ceylon prevented his plans from being carried out.

In 1814 he made a botanizing expedition into France, Switzerland, and the north of Italy, which extended over a period of nine months, and in the course of which he became acquainted at Paris and elsewhere with the principal botanists of Europe, thus laying the foundation of an extensive intercourse and correspondence which lasted until his death.

In 1815 he married the eldest daughter of Dawson Turner, of Yarmouth, Esq., and settled at Halesworth, in Suffolk, where his house at once became the rendezvous of British and foreign botanists, and where he commenced the formation of his great herbarium.

His first botanical work was that on the British *Jungermannia*, which was completed in 1816. The 'Muscologia Britannica' was published, in conjunction with Dr. Taylor, in 1817, and was followed by the 'Musci Exotici.' These and other works, added to his increasing home and foreign correspondence, fully occupied his time for the next five years of his life. Meanwhile his property had been rapidly deteriorating, and, with an increasing family, he found it necessary to look out for some remunerative scientific employment. He was therefore advised by his friend Sir Joseph Banks to accept the then vacant Regius Professorship of Botany in the University of Glasgow, which, although not a medical man, Sir Joseph was able to procure for him; and in 1820 he accordingly removed to Glasgow, where his life was entirely devoted to botany: he rose early and went late to bed, visited but little, avoiding society except on his occasional journeys to England, and devoted the whole powers of his mind and his pencil to his favourite science. He was a most popular lecturer, his class being sometimes attended by as many volunteers as medical men. He encouraged his students in the pursuit, by taking them on excursions, by giving them rare plants from his duplicates, and by furnishing them with letters of introduction to all

parts of the world when they went abroad. And his success as a teacher was in some degree commensurate with his efforts,—his salary from Government, which on his first appointment to the Chair was only £50, having been increased to £150, and the other emoluments of the Professorship, arising chiefly from students' fees, having risen from less than £60 to about £700, the number of students having increased from twenty-one to upwards of one hundred.

During his residence in Glasgow, also, his merits became so conspicuous that he was twice offered the honour of knighthood, which he accepted from William the Fourth in 1836, the honour being bestowed on him "in consideration of his scientific career and the great services he had rendered to Botany."

But a further, and, in the interests of botanical science, far more important, acknowledgment of his merits was evinced in his appointment, in 1841, to the Directorship of the Royal Gardens at Kew.

It is a curious fact that Sir William Hooker had from the commencement of his botanical career felt a strong interest in Kew, and had never abandoned the secret idea that the time would come when he might hold the post of its Director. For many years during his Glasgow residence, the late John Duke of Bedford had honoured him with his friendship and correspondence, subscribing munificently to the expense of collectors whom he sent out, and by means of his diplomatic relations and friends enlarging Sir William's sphere of action in various parts of the world.

The placing of Kew on a national footing had been for some time a common object both with the Duke and Sir William Hooker; and the former did not fail, before his death in 1839, to urge upon those in political power the fulfilment of his favourite project. Upon his death, his son, the late Duke of Bedford, zealously carried out his father's wishes; but it was upon the present Earl Russell, then Lord John, that the chief weight of the transaction fell; and it is to him, then First Lord of the Treasury, that the nation owes the possession of these magnificent gardens.

In 1841 Mr. Aiton (the Director of all the Royal Gardens, whether fruit, kitchen, or botanical) resigned his post at Kew, having held it for fifty years. He was succeeded by Sir William, who received a salary of £300 per annum, with £200 to enable him to rent such a house as should accommodate his herbarium and library, by this time of immense extent, and essential, we need not say, to the working of the establishment, whether in a

scientific or economic point of view. Sir William entered upon his duties in command of unusual resources for the development of the Gardens, such as had never been combined in any other person. Single in purpose and straightforward in action, enthusiastic in manner, and at the same time prepared to advance by degrees, he at once won the confidence of that branch of the Government under which he worked, which was then known as the Office of Woods and Forests, under the Presidency of Lord Duncannon. To those in office above him he imparted much of the zeal and interest he himself felt, which was proved by constant visits to the Gardens, resulting in invariable approval of what he was doing, and promises of aid for the future. Another means at his disposal, and which he at once brought to bear on the work in hand, was his extensive foreign and colonial correspondence, including especially that with a large number of students whom he had imbued with a love of botany, and who were scattered over the most remote countries of the globe, and several of whom, indeed, remained in more or less active correspondence with the Gardens up to the day of his death. His views were further greatly facilitated by his friendly intercourse with the Foreign and Colonial Offices, the Admiralty, and the East India Company; to all of which departments he had been the means of rendering services, by the recommendation of former pupils to posts in their employment, and by publishing the botanical results of the expeditions they sent out.

At the time of Sir William's taking office the Gardens consisted of 11 acres, with a most imperfect and generally dilapidated series of ten hothouses and conservatories. Most of these have since been gradually pulled down; and, with the exception of the Great Orangery (now used as a museum for woods) and the large architectural house near the garden gates, and which had just previously been removed from Buckingham Palace, not one now remains. They have been replaced by twenty-five structures (in most cases of much larger dimensions), exclusive of the Palm stove, and the hitherto unfinished great Conservatory in the pleasure-grounds.

It might well be supposed that the arduous and continuous labours incident more especially to the organization and establishment of such an institution as that of the Royal Botanic Gardens, and the almost incessant calls upon the time and energies of the Director, would have left Sir W. Hooker but little opportunity or strength during the twenty-four years he occupied that post

for scientific pursuits ; such, however, was far from being the case. By keeping up the active habits of his early life, he was enabled to get through a greater amount of scientific work than any other botanist of his own or, perhaps, of any period. He is enumerated by M. Alphonse De Candolle together with Linnæus and Augustin-Pyramus De Candolle, as one of the three most laborious botanists who ever lived ; and of these three, his works appear to have been the most numerous ; in proof of which it may be mentioned that his own and his joint works are included in six or seven folio, four quarto, and eighty-seven octavo volumes, including in the whole not less than 4094 plates ; whilst M. De Candolle estimates that the number of new species described by him equals, if it does not exceed, that of the plants first described by the elder De Candolle—viz. 6350. It should be remarked also that this amazing fecundity was not displayed at the expense of accuracy, few men having so rarely committed a mistake, either in the naming or classification of a new species. Another peculiarity (as it may be termed, in so voluminous a writer and so busy a man) well worthy of record is, the circumstance that Sir W. Hooker, like Linnæus, never left a work unaccomplished ; whatever he undertook was undertaken with a full conception of its requirements, and as fully carried out.

His works are for the most part entirely of a descriptive nature, and on the subject of both Cryptogams and Phanerogams, regarded either as connected with the flora of a country or as individual species. The following list, which I extract from M. A. De Candolle's memoir, includes those of most consequence :—

1. British Jungermannia, 1 vol. fol., 88 pl., 1813.
2. Musci Exotici, 2 vols. 8vo, plates, 1818–20.
3. Muscologia Britannica, 1 vol. 8vo, 1818.
4. Flora Scotica, 1 vol. 8vo, 1821.
5. British Flora, 2 vols. 8vo, 1830–31.
6. Flora Boreali-Americana, 2 vols. 4to, 1833–40.
7. Icones Filicum, 2 vols., 1829–31, in conjunction with Dr. Greville.
8. Genera Filicum, 8vo, 1842, with 120 plates.
9. Species Filicum, 5 vols. 8vo, 1846–64, with 304 plates.
10. Exotic Flora, 3 vols., 1823–27, with 232 coloured plates.
11. Icones Plantarum, 5 vols. 8vo, 1827–54, with about a thousand plates, mostly drawn by himself.
12. Botanical Magazine, edited by him from 1827 to his death, in more than 25 volumes, with 2700 coloured plates and descriptions.

13. Lastly may be mentioned several other botanical journals published by him from 1830 to 1853, in about 25 volumes, and the greater part of whose contents were from his pen, viz., Botanical Miscellanies, Companion to the Botanical Magazine, Journal of Botany, London Journal of Botany.

After this brief and imperfect survey of Sir W. Hooker's life and labours, it remains to say a few words with respect to his personal character, and the beneficial influence it has had upon the progress of botanical science in this country and, in fact, throughout the world, in no part of which has his influence been unfelt. With this end I cannot do better than quote the words of one who of all men knew him best and is best able to appreciate his worth and the value of his example:—

“An almost unbounded liberality was one of his most prominent features; and scientific botany is more indebted to him than to any individual since Sir Joseph Banks for the progress it has made within the last half century. In his dealings with Government his conduct was as liberal as it was towards his fellow botanists. For the first twelve years of his residence at Kew, his herbarium and library were not only kept up at his own expense for the use and benefit of the public establishment, but were further open to every botanist who came to his house to make use of them. To him we are indebted for the appointment not only of botanists but naturalists to the majority of the Government expeditions of discovery, survey, and research which have been sent out during the last thirty years; and it is through his energy that funds were forthcoming from Government to meet the after-expenses of the publication of their results. To young botanists he was especially kind and helpful; indeed there are few cultivators of this science in Europe or America who have not paid lavish tribute to his generosity and encouragement. Last among his efforts has been the inducing of the Home and Colonial Governments to grant the necessary funds for the publication of the Floras of their possessions; and within the two last years of his life he prevailed upon Sir Charles Wood, then President of the India Board, in like manner to support the publication of the Flora of British India; and through the influence of his steady friend Earl Russell he procured a grant for the publication of the Flora of Tropical Africa.”

Whilst, as showing the estimation in which he was held beyond the limits of his own country, I would append the following passages from the pen of Professor Asa Gray, whose long and

intimate friendship with Sir W. Hooker and eminence as a botanist render what he says of his departed friend and fellow labourer well worthy of being reproduced on the present occasion.

“Our survey of what Sir William Hooker did for science would be incomplete indeed, if it were confined to his published works—numerous and important as they are—and to the wise and efficient administration through which, in the short space of twenty-four years, a Queen’s flower and kitchen garden and pleasure grounds have been transformed into an imperial botanical establishment of unrivalled interest and value. Account should be taken of the spirit in which he worked, of the researches and explorations he promoted, of the aid and encouragement he extended to his fellow-labourers, especially to young and rising botanists, and of the means and appliances he gathered for their use no less than for his own.

“The singlemindedness with which he gave himself to his scientific work, and the conscientiousness with which he lived *for* science while he lived *by* it, were above all praise. Eminently fitted to shine in society, remarkably good-looking, and of the most pleasing address, frank, cordial, and withal of a very genial disposition, he never dissipated his time and energies in the rounds of fashionable life, but ever avoided the social prominence and worldly distinctions which some sedulously seek. So that, however it may or ought to be regarded in a country where Court honours and Government rewards have a factitious importance, we count it a high compliment to his sense and modesty that no such distinctions were ever conferred upon him in recognition of all that he accomplished at Kew.

“Nor was there in him, while standing in a position like that occupied by Banks and Smith in his early days, the least manifestation of a tendency to overshadow the science with his own importance, or of indifference to its general advancement. Far from monopolizing even the choicest botanical materials which large expenditure of time, and toil, and money brought into his hands, he delighted in setting other botanists to work upon whatever portion they wished to elaborate, not only imparting freely, even to comparatively young and untried men of promise, the multitude of specimens he could distribute, and giving to all comers free access to his whole herbarium, but sending portions of it to distant investigators, so long as this could be done without too great detriment or inconvenience. He not only watched for opportunities of attaching botanists to Government expedi-

tions and voyages, and secured the publication of their results, but also largely assisted many private collectors, whose fullest sets are among the treasures of by far the richest herbarium ever accumulated in one man's lifetime, if not the amplest anywhere in existence."

Francis Ablett Jesse, Esq., F.G.S., was the son of the late John Jesse, of Llanbedr Hall, Denbighshire, well known as a pleasing popular writer on zoological subjects, and who died in September 1863, after having been forty years a Fellow of this Society. Mr. Francis Jesse therefore has at any rate an hereditary claim to the regard of naturalists, and was himself not undistinguished as an entomologist. He died at an early age, on the 22nd November, 1865, having been admitted a Fellow of the Linnean Society on the 5th December, 1861.

John Lee, LL.D., Q.C., F.R.S., &c. &c., died at an advanced age at Hartwell House, his residence, near Aylesbury, on the 25th of February. Though some time a Fellow of this Society, into which he was admitted on the 4th December, 1855, and well known for the encouragement he always afforded to those engaged in natural-history pursuits, Dr. Lee had not himself paid much attention to those branches of science. That to which he was more particularly devoted was Astronomy, which he cultivated with much assiduity with the aid of an observatory he had established at his residence, and with such reputation and success as to lead to his being selected to fill the Chair of the Royal Astronomical Society. Somewhat excentric in his views on various subjects, Dr. Lee was an ardent politician of extreme radical views, a teetotaler, and as great an enemy to tobacco as King James the First. In his character of a politician he, on several occasions, contested the county seat with Mr. D'Israeli, but never with any chance of success.

In him his neighbours have lost an active magistrate, and science has to deplore, if not a very distinguished, yet a very ardent and ready auxiliary.

Edward Frederick Leeks, Esq., a Solicitor by profession, and Secretary of St. Ann's Schools, died November 1, 1865. I am not aware that he had contributed anything to science; but he was an old Fellow of this Society, into which he was admitted in the year 1845.

John Lindley, LL.D., F.R.S., was born at Catton, near Norwich, on the 5th of February, 1799. His father was a nurseryman of considerable ability, and known to gardeners as the author

of 'A Guide to the Orchard and Kitchen Garden.' He was educated at the Grammar School of Norwich, under the head-mastership of the well-known scholar and schoolmaster Dr. Valpy. At this early period of his life Dr. Lindley's pursuits and tastes, as well as his habits of assiduity and perseverance, may be taken as a good illustration of the saying that the "child is the father of the man." He was greatly devoted as a school-boy to the study of plants and of antiquities. At the age of sixteen he quitted school, and was shortly afterwards sent on business to Belgium, in the service of Mr. Wrench, a seed-merchant at Camberwell. On his return from this mission he remained at home with his father, devoting his spare time indefatigably to botany, horticulture, and entomology. The late Sir W. J. Hooker, who was fourteen years his senior, and had also been educated at Dr. Valpy's school, at that time resided in Norwich, and was in the habit of visiting Mr. Lindley at Catton to procure plants and insects. Thus commenced an acquaintance, which was continued after Mr. Hooker's removal to Halesworth, and gradually ripened into a life-long friendship. At Halesworth Lindley may be said to have commenced his laborious literary and scientific labours, with a translation of Richard's '*Analyse du Fruit*,' which he finished at a single sitting, which lasted, however, three days and two nights without intermission. This was published in 1819. About this time, his father having met with reverses in business, Lindley proceeded to London, and found employment as Assistant-Librarian to Sir Joseph Banks, to whom he had been already introduced by his friend Mr. Hooker, and of whose liberality and kindness Dr. Lindley always spoke in the warmest terms, and whose assistance at this juncture was the more valuable as Lindley had made himself responsible for his father's debts. Sir Joseph also recommended him to Mr. Cattley to edit the '*Collectanea Botanica*.' This work, which is remarkable for the beauty and truth of its illustrations, was published in 1821, and its editor, even at that early period of his career, was able to sign himself a Member of the Imperial Academy of Naturalists of Bonn. But in the previous year Lindley had published his '*Rosarum Monographia*,' which was dedicated to Mr. Charles Lyell of Kinorley, the father of the present celebrated geologist, who was so much pleased with the work that he sent the author a cheque for £100. With this money Lindley purchased a microscope and a small herbarium, which formed an important addition to his own collection.

In 1822 Lindley became Garden Assistant Secretary to the Horticultural Society, whose garden at Chiswick was then in process of formation, partly under Lindley's superintendence. In 1826 he was appointed sole Assistant Secretary to the Society, and from this time may be said to have been its mainspring. In 1830, at the time of Mr. Sabine's resignation, owing to circumstances over which Mr. Lindley had no control, the Society got into difficulties, which taxed his energies and attention to the utmost to overcome. But in conjunction with Mr. Bentham, who had succeeded Mr. Sabine as Honorary Secretary, these difficulties were vanquished, chiefly by the institution of exhibitions of flowers and fruit, in place of the former expensive fêtes. Before Mr. Bentham's resignation in 1841, arrangements were made by which almost the whole business which had belonged to the office of Honorary Secretary should fall upon Dr. Lindley, who thereupon took the designation of Vice-Secretary. In this office he continued until 1858, when he became Secretary to the Society and Member of the Council, a position which he held till the Exhibition of 1862, whose overwhelming business, in which he took so active a part, compelled him to relinquish any further share in the management of the Horticultural Society.

Had Dr. Lindley done no more than attend to the affairs of the Society in the way he did, he would have accomplished as much as most men could have done; but his energy was inexhaustible, and until he had passed fifty years he never knew what it was to be tired either in body or mind. In addition to his duties at the Horticultural Society, he filled the Chair of Botany at the London University College, and at the Botanic Garden of the Apothecaries' Company at Chelsea, in which latter establishment he also held the office of '*Præfectus horti*.' He filled the Chair at University College for thirty years, or from 1829 to 1861, and continued to lecture at Chelsea till 1853. His lectures were remarkable for their clearness, conciseness, and the profuseness with which they were illustrated. It was mainly for the use of his numerous pupils in these classes that he published many of his best-known works; but his two general works, the '*Vegetable Kingdom*' and the '*Theory of Horticulture*,' were the results of long-continued labour bestowed on the collecting and digesting of a vast store of materials.

But the numerous works published under his name, and many of which have undergone several editions, give but a partial idea of the indomitable industry and energy of their author. The

greater part of the descriptions in 'Loudon's Encyclopedia of Plants' were drawn up by him. He also conducted the whole of the 'Botanical Register,' except during the first few years; and with very little assistance 'Lindley and Paxton's Flower Garden.' The excellent botanical articles in the 'Penny Cyclopaedia,' down to the letter R, and a treatise on Botany, published by the Society for the Diffusion of Useful Knowledge, were all from his fertile pen. Besides these, to him are due the greater part of the eighth and the whole of the ninth volume of Sibthorp's 'Flora Græca;' and from 1831 to 1837 he was engaged with Mr. William Hutton on the 'Fossil Flora of Great Britain.' He was author, moreover, of several valuable works on horticulture, commencing with the 'Outlines of Horticulture,' which was followed in 1840 by the 'Theory of Horticulture,' which was reproduced in America, and translated into almost every European language, and reached a second edition in this country in 1855, when, its title being changed into 'Theory and Practice of Horticulture,' it obtained a much more extensive sale amongst English practical horticulturists than it had previously enjoyed, notwithstanding its popularity in other countries. Nor in this very scanty enumeration of Dr. Lindley's voluminous writings should be omitted his magnificent 'Sertum Orchidaceum,' which was completed in 1838, the 'Genera and Species of Orchidaceous Plants,' between 1830 and 1840; and a second edition of the latter, under the title of 'Folia Orchidacea,' was commenced in 1852, but never completed, as it ceased to appear in 1859. In the 'Linnean Transactions' there is a beautifully illustrated paper from him on the *Pomaceæ*; and a shorter notice in a subsequent year on the "Anatomy of the Roots of Ophrydeæ." And the Journal of the Society also contains several important papers, chiefly on the subject of Orchidaceous Plants.

In addition to the foregoing labours, we find Dr. Lindley, in conjunction with the late Sir Joseph Paxton, in the year 1841, projecting and establishing the now well known and deservedly popular 'Gardener's Chronicle,' of which he was editor for twenty-five years, and to whose columns he was a constant and invaluable contributor.

With respect to the scientific mode, and the thoroughly honest, manly, and independent spirit in which that journal was conducted by him, it is needless here for me to make any remark. All are well acquainted with it.

Dr. Lindley was a Member of about sixty Scientific Societies,

and became a Fellow of this Society March 20, 1820, and of the Royal Society in 1828; and in 1832 he received the Diploma of Doctor of Philosophy from the University of Munich, and in 1853 was chosen a Corresponding Member of the French Institute. In 1857 he received one of the Royal Medals, in "recognition of the value of his labours in various branches of Scientific Botany," and more especially for his learned and comprehensive works on the Natural Orders of Plants, on the Orchidaceæ, and on Theoretical and Practical Horticulture. To which may be added a passage from the President's Address with reference to horticulture:—"Nor is it too much to say that it is mainly due to his efforts that this branch of knowledge has risen from the condition of an empirical Art to that of a developed Science."

In 1851 Dr. Lindley was one of the Jurors appointed to investigate and report upon the substances used as food displayed in the Great Exhibition of that year, the duties of which office, performed as they would be by him, in conjunction with his other labours, were so onerous that he became in consequence seriously ill. At the time of the second Exhibition, in 1862, he was induced, against the advice of his family, to take charge of the whole Colonial Department; and although constantly complaining of headache, from which he had never before suffered, he refused to abandon his post. The consequence that might have been expected followed; and at the close of the Exhibition it was obvious that his mental and bodily powers had received an injury, from the effects of which they never recovered.

He died, rather suddenly, on the 1st of November, 1865.

Sir John William Lubbock, Bart., M.A., F.R.S., F.G.S., &c., was born on the 26th of March, 1803, the son of Sir John W. Lubbock, Bart.; he died on the 20th of June, 1865, at his residence, High Elms, near Farnborough, in Kent. Sir John was educated at Eton and at Trinity College, Cambridge, where he graduated in 1825, taking high honours in Mathematics. He was a first-rate mathematician, and for many years was devoted to science, and particularly to that of Astronomy, in connexion with which his attention was more particularly directed to questions respecting the Action of the Tides, the Theory of the Moon, and the Perturbations of the Planets, the determination of the distance of a Comet from the Earth, and the elements of its orbit. He was Treasurer of the Royal Society from 1830 to 1835, and again from 1838 to 1845, and was for many years Vice-Chancellor of the University of London. In 1834 the Royal Society awarded

him one of the Royal Medals for his paper "On the Tides;" in 1848 the Astronomical Society gave him a testimonial for his "Researches on the Theory of Perturbation;" and in 1836 he delivered the Bakerian Lecture "On the Tides at the Port of London." Besides these communications, Sir John W. Lubbock contributed many papers on similar subjects in the 'Philosophical Transactions,' the 'Memoirs of the Royal Astronomical Society,' the 'Cambridge Philosophical Society,' and the 'Reports of the British Association.'

He also published several important works on astronomical and mathematical subjects between 1830 and 1840, in which year, on the death of his father, he succeeded to the Baronetcy, and devoted his whole attention, or nearly so, to his business as a Banker in the City of London. One of his last, if not his last, published contributions to science was, however, produced in 1848, when he read a paper to the Geological Society "On Change of Climate, resulting from a change in the Earth's Axis of Rotation"—a paper which, as observed by the late President of the Geological Society, "derives additional interest from the discussions which have been recently carried on."

He became a Fellow of this Society on the 4th of November, 1828, but never contributed anything to our publications.

Thomas White Mann, Esq., M.R.C.S. & L.A.S., was an eminent and much esteemed medical practitioner, residing at Upper Holloway, where he died, after a very short illness, on the 30th of May, 1865, in his fifty-fourth year.

Dr. Jean François Camille Montagne, Member of the Institute of France and of numerous other learned Societies, died on the 9th of January, 1866. The great distinction which he long since attained in all branches of Cryptogamic Botany has rendered his name familiar to science; but many persons are probably unacquainted with the varied scenes of his prolonged career, a short account of which we are enabled to give from M. Hoefer's "Biographie Générale:"—"He was born on the 15th of February, 1784, at Vaudoy (Seine et Marne). He was the son of a surgeon, who died while he was yet an infant, under such circumstances that, from want of sufficient means, he was almost self-educated. At the age of fourteen he went into the navy, into which he entered at Toulon as a master's mate, and soon took part in the expedition to Egypt, where he was employed in the civil department, and ultimately as secretary to the military controller of the navy. In 1802 he returned to France with the army which had

capitulated at Alexandria, and devoted himself to the study of medicine. He qualified as surgeon in 1804, and was attached to the military hospital at Boulogne, and thence sent in 1806 to the army of Naples. In 1807 he was authorized by the Emperor to pass into the guard of King Joseph, and served in the regiment of Grenadiers, of which he became the following year, on the arrival of King Murat, surgeon-major, being at the same time nominated a Knight of the Royal Order of the Two Sicilies. In 1814 he was charged with the surgical service of the Royal Guard of Murat, and in 1815 received the title of Surgeon-in-Chief, and was charged with the superintendence of the medical service of the army. In consequence of a disastrous campaign, the French, in spite of the engagement entered into with the Austrians to respect their liberty, were all made prisoners of war and carried off into the fortress of Arad, in the depths of Hungary. In 1816 they were allowed to return to their country, where, after a year's anxious delay, he obtained his readmission on half-pay as surgeon-major. After having practised medicine at Paris, and, in the intervals of leisure, devoted himself to the study of Greek, for which he had an original predilection, he was recalled to the service as surgeon-major in 1819. He then took part in the Spanish Campaign; and his conduct at the siege of Pampeluna gained for him the Cross of Honour. In 1830 he was made the head of the military hospital at Sedan. Two years later he obtained his discharge, and established himself at Paris. For a long time his taste had turned towards Botany, in which Laurent de Jussieu, Desfontaines, and Claude Richard had been his masters. While in service he visited successively Lorraine, the Vosges, Spain, Brittany, the isles of Hyères, Lyons, the Pyrenees, and Ardennes, where he made large collections. But on his return to Paris he found the study of Cryptogamic plants, to which he was especially attached, almost abandoned in France, or at least so far neglected that travellers were obliged to send their Mosses, Fungi, Lichens, and Algæ to Sweden, Germany, and England for determination. This was the case with Gaudichaud and Auguste de Saint Hilaire, both Members of the Academy. Induced by a desire to be useful, M. Montagne devoted himself with as much zeal as disinterestedness to a branch of botany which had fallen into abeyance, and for twenty years gave up ten hours a day to it. He introduced, described, and figured in great measure almost 2000 species; and to arrive at this result he entered into the most active correspondence with the principal botanists of Europe and America. This perseverance

met at last with its due recompense: after having had seven votes in 1837 as candidate for the Institute, he was elected almost unanimously in 1853 as successor to Achille Richard, and finally, on the 8th of April, 1858, received the cross of an officer of the Legion of Honour."

With regard to Dr. Montagne's contributions to science, a large proportion of them appeared in the '*Annales des Sciences Naturelles*.' In the different series of that periodical he described from time to time, in separate Centuries, between 800 and 900 plants belonging to different Cryptogamic orders. Besides these he gave, in the '*Annales des Sciences*,' accounts of several different collections of Cryptogamic plants, viz. of the Cryptogams of the neighbourhood of Algiers, collected by M. Roussel, of Brazilian Cryptogams collected by St. Hilaire, of Fungi collected by Drège in tropical Africa, of the Cryptogamic plants of French Guiana, collected by Leprieur, of the Cryptogams of the Neilgherry Hills, collected by Perrottet, of the Cryptogams of the island of Juan Fernandez, collected by Bertero, of the Fungi of Belanger's East-Indian travels, and of the Cryptogams collected during the voyage of the '*Astrolabe*' and the '*Zélée*.'

Of those of his publications which appeared separately, the principal are, '*The Cryptogams (Algæ, Lichens, Hepaticæ, and Mosses) collected during the voyage of La Bonite*;' the "*Plantæ Cellulares*," forming the last part of the '*Histoire Naturelle des Canaries*;' the "*Cryptogamia*" of Ramon de la Sagra's '*History of Cuba*;' the "*Algæ, Collemaceæ, and Podaxineæ*," and (in conjunction with M. Durieu de Maisonneuve) the "*Pyrenomycetes*," of the '*Exploration scientifique de l'Algérie*;' and the "*Cryptogams*" of Gay's '*History of Chili*.'

In 1856 Dr. Montagne conferred a great boon upon science by collecting and arranging systematically in one volume all the genera and species of Cryptogamic plants described in his separate works and detached papers. This valuable book, familiar to cryptogamic botanists as Montagne's '*Sylloge*,' contains also a list of the author's works and papers, to which I must refer those readers who are desirous of a fuller account of his labours than the space at my command enables me to give.

From a notice written by a personal friend of Dr. Montagne, and which appeared in the '*Gardener's Chronicle*' of the 20th of January last, we learn that he had for some time been quite incapacitated for any exertion, and had almost lost the power of speech. The eulogistic remarks of the writer in question will be

cordially subscribed to by all botanists, when he says that "his (Dr. Montagne's) decease reminds us forcibly of the fact that the scientific world has sustained a loss which is not likely to be repaired very speedily. Intimate as he was with almost every branch of Cryptogamic Botany, his pen and pencil were ever ready to record the novelties which were pouring into Paris from every quarter; and his extensive correspondence and valuable herbarium gave a precision to his diagnoses which can scarcely be too highly appreciated."

Dr. Montagne's attention was not confined to botany; for he appears to have been a scholar of no mean acquirements, and to have been distinguished also for his musical attainments. In private life he was universally respected for his kindness and hospitality, and for his genial and entertaining qualities.

He was elected a Foreign Fellow of the Linnean Society on the 2nd of May, 1854; and died at Paris on the 9th of January, 1866, at the age of eighty-two.

Sir Joseph Paxton, M.P., F.R.S., was born in the year 1801, at the village of Milton Bryant in Bedfordshire, where his father was a farmer. Having to work for his livelihood, he selected gardening as his profession, and at the age of 15 entered the service of Sir Gregory Osborne Page Turner, of Battlesden Park, whence, at the end of two years, he went to Woodhall Park, near Watton, Herts, the residence of Samuel Smith, Esq., in whose gardens, then under the charge of Mr. William Griffin, an eminent horticulturist of his day, he continued for three years, and was thus enabled to acquire a thorough practical knowledge of the most important branches of horticulture. On leaving Woodhall he returned to Battlesden, where he filled the post of gardener for two years, and in the autumn of 1823, being then 22, he came to London, and was employed in the garden of the Duke of Somerset at Wimbledon. About this time the Horticultural Society commenced the formation of their garden at Chiswick; and the opportunity for study and improvement in his profession thus afforded was eagerly seized upon by young Paxton, who, upon the recommendation of Mr. Sabine, the Honorary Secretary of the Society, was admitted into the new gardens in 1823, and in the following year appointed foreman of the Arboretum. In this capacity he was fortunate enough to attract the notice of the late Duke of Devonshire, who took great interest in this department of the garden, and had frequent occasion to apply to the foreman for information respecting such trees and shrubs as were

new to him. The trim and neat appearance by which Paxton was always distinguished, combined with his great intelligence and genuine manliness of deportment, made such an impression upon the Duke that in 1826 he engaged him to superintend the gardens and plantations at Chatsworth.

Mr. Paxton had now ample scope for his abilities, and very soon fully justified the Duke's discernment in selecting him. Under his hand, as a writer has observed, the wild Derbyshire region in which Chatsworth stands became the wonderful place which drew visitors from far and near, and set the example of that princely development of grounds and plaisances which now marks the country-seats of our great English families. Its fountains and Italian terraces, its rich woods, laid out and managed with such marvellous skill and care, its vast range of hothouses, where the *Victoria regia* was first induced to blossom, and the Great Conservatory, the precursor of the Crystal Palaces of Hyde Park and Sydenham, all now familiar objects of admiration, were in great measure created by his genius.

Thus attentive to and successful in the performance of his duties, it is no wonder that Mr. Paxton became more and more valued by the Duke; and the skill and abilities he displayed in regard to some financial arrangements induced His Grace to entrust him with the general superintendence of his large estates in Derbyshire. In 1838 he accompanied the Duke abroad for an entire year, during which time, having traversed Switzerland and Italy, he visited Greece, Turkey, Asia Minor, Malta, Spain, and Portugal.

In 1850, however, it was that Paxton's name became almost a household word, in consequence of the unexampled success of his daring plans for the erection of the first Great Exhibition Building in Hyde Park, the history of which is too well known for me here further to refer to it, or to his subsequent connexion with the present Crystal Palace at Sydenham, in which he took so prominent a part, and which, together with the beautiful grounds laid out by him, will long remain a monument of his enterprise and skill.

Sir Joseph Paxton was an industrious writer on horticultural and botanical subjects, and one of the founders of the 'Gardener's Chronicle.'

In 1854 he was returned as Member of Parliament for Coventry, which borough he continued to represent up to his death on the 8th of last June.

Sir Joseph Paxton's career is a striking proof of what a man in this country may achieve by native talent combined with good conduct, industry, and intensity of purpose. And the character of kindness he has left amongst those who were best acquainted with him shows how little such men are spoilt by the most dazzling success.

James Rankine, Esq., M.D., who was admitted into the Society in 1840, died on the 10th inst. at Irvine, Scotland.

Lovell Reeve, Esq., was born in London on the 19th of April, 1814. After receiving a good classical education, he was apprenticed, at the age of 13, to a grocer on Ludgate Hill, where the accidental arrival of a sailor with a handkerchief full of shells, of which he became the purchaser, led to his becoming an ardent student of Conchology. In the pursuit of this branch of natural history he was much assisted by a Mr. Walker, also a zealous conchologist, as well as by Dr. J. E. Gray. In 1833 he attended the third meeting of the British Association, at Cambridge; and had at that time obtained a sufficient reputation to be appointed, in the Natural-History Section, Conchologist to a general exploring expedition to the fens between Cambridge and Ely.

On the termination of his apprenticeship Mr. Reeve proceeded to Paris, where he made his first contribution to the literature of conchology in the form of a paper "On the Classification of the Mollusca," which was read at a meeting of the Academy. On his return to London he devoted himself with increased earnestness to his favourite study, and shortly afterwards produced his '*Conchologia Systematica*,' in two 4to volumes, with 300 plates. His zeal was such that the publication of this work exhausted his funds, even to the sacrifice of his share in his deceased father's estate.

About this time, however, the fortunate and almost accidental purchase of a valuable collection of shells at Rotterdam, made with great care at the Moluccas by the Dutch Governor-General Van Ryder, enabled Mr. Reeve to resume his favourite occupation. He was soon enabled to undertake the publication of an illustrated work on the species of shells, entitled '*Conchologia Iconica*,' the value of which has been universally recognized, and which was continued almost uninterruptedly from 1843 down to the time of his death. In 1850 Mr. Reeve also published a useful elementary work, entitled "Elements of Conchology, an Introduction to the Natural History of Shells and of the Animals which form them." And on his removal to Henrietta Street he

became the publisher of many richly illustrated works on botanical and other natural-history subjects, and was afterwards proprietor of the late 'Literary Gazette,' which he edited with great ability, though unfortunately not with great pecuniary success, from 1850 to 1856. His last work, and by some considered his best, 'On the Land and Freshwater Molluscs of the British Isles,' was published in 1863.

In June 1846 Mr. Reeve read a paper before this Society "On the Calcifying Functions of the Cowry and the Olive," which was published in the Proceedings for that year; and in the following year a more important paper, "On the Structure and Comparative Physiology of *Chiton* and *Chitonellus*," which was published in the nineteenth volume of the Linnean Transactions.

In private life Mr. Lovell Reeve was universally respected and esteemed. He died on the 18th of November, 1865, after having endured with the most exemplary patience the acute sufferings caused by a most painful illness.

Sir John Richardson, M.D., C.B., F.R.S., was born in Dumfries in the year 1787, and died at Grassmere, on the 5th of June, 1865. This most distinguished naturalist and Arctic traveller received his early education at the Grammar School of his native town, and at the age of 14 proceeded to Edinburgh for his medical education. In 1807 he entered the Royal Navy as Assistant-Surgeon, in which capacity he was present at the siege of Copenhagen. In 1816 he graduated in Edinburgh, and was appointed Surgeon to the 'Hercules,' 74; and in this and other vessels he continued to serve during the remainder of the war, and more especially in the operations on the coast of Georgia under Sir George Cockburn, in which he was actively engaged in the capacity of surgeon to the marines employed on shore.

In 1819 he was appointed to accompany the first polar land expedition under Sir John Franklin. The extreme hardships and perils undergone by him in common with the rest of this expedition, and the heroic manner in which they were borne, are too well known to need relation here; and the way in which Dr. Richardson's part in it was appreciated by his chief cannot be better given than in Sir John Franklin's own words:—"To Dr. Richardson the exclusive merit is due of whatever collections and observations have been made in the department of natural history; and I am indebted to him in no small degree for his friendly advice and assistance in the preparation of the present narrative."

In the years 1825-28 Dr. Richardson formed part of Franklin's

second expedition to the same regions, in which the exploration of that part of the coasts of the Arctic Sea between the Mackenzie and Coppermine Rivers, a distance of 902 miles, was entrusted solely to him, while Franklin himself proceeded along the coast to the westward and reached a spot within 160 miles of Icy Cape. The two expeditions thus comprised an extent of coast-line of nearly 2000 miles; whilst, as observed by the President of the Royal Geographical Society in his obituary notice of Sir John Richardson, "it was not geography alone that was benefited by their labours; for the meteorological and magnetical observations, combined with those collections in the department of natural history which, while taking a share in the labours of his companions, were the especial vocation of Richardson, rendered the account of these voyages especially interesting to the scientific world; and the publication of that excellent work the '*Fauna Boreali-Americana*' proved how well he was qualified for the position he had been selected to fill."

In 1838 Dr. Richardson was appointed Physician to Haslar Hospital, and in 1840 was promoted to the rank of Inspector in the Naval Medical Service; whilst in 1846, in consideration of his eminent services, he received the honour of knighthood.

Undeterred by the dangers and hardships he had undergone in the two previous Arctic expeditions in which he had taken part, and when he had passed his sixtieth year, Sir John Richardson, with almost unexampled devotion to the claims of friendship, again volunteered his services for a third time in the same inclement regions in search of his former chief Sir John Franklin. In this expedition, which was undertaken in company with Dr. Rae, Sir John Richardson descended the Mackenzie River, and traversed the Arctic shores between that river and the Coppermine; an account of which hazardous and, alas! fruitless journey was published in 1851.

The heroic manner in which the various labours and perils of these Arctic journeys were undergone by Sir John Richardson sufficiently shows that, as a geographical explorer, he was a man of indomitable courage, energy, and determination. But, besides this, he possessed an accurate and extensive knowledge of most branches of natural history, amongst which he was, however, more especially devoted to ichthyology, in which he had few superiors, and to which he remained attached to the end of his life.

In personal character, as in his appearance, Sir John Richardson was distinguished by a certain apparent ruggedness, suggestive,

as observed by Sir Roderick Murchison, of the boreal regions, in which so many years of his life had been passed; but beneath this exterior was a warm and feeling heart, and no one was more ready than he to aid to the utmost of his power those who, his close and cautious powers of observation and discrimination (though perhaps silently exercised) showed him, were worthy of his countenance.

Samuel P. Woodward, F.G.S., the son of Mr. Samuel Woodward, of Norwich, was born on the 17th of September, 1821, and died at Herne Bay July 11th, 1865.

Almost always in weak health, and very frequently in a state of great suffering from an asthmatic affection, the amount of scientific work performed by Mr. Woodward in his short life is very surprising. Devoted to the study of natural history, it may be said he showed his aptitude for it even from his infancy; for he assisted, when he had scarcely attained the age of 10 years, in publishing an account of *Trichiosoma lucorum* in the 'Magazine of Natural History,' with an engraving of the insect in all its stages. In the following year he began the study of land and freshwater shells, and commenced the formation of his father's collection. To these pursuits he soon added the study of botany, after which entomology was given up, and he devoted his whole attention to botany and malacology.

In 1838 he came to London to complete his education at the London University College, and soon obtained an appointment in the Library of the British Museum. In 1839 he succeeded Mr. Searles Wood in the post of Subcurator of the Geological Society, the duties of which office necessarily compelled him to add palæontology to his other studies. This post he continued to occupy, with the utmost credit to himself and satisfaction to the Society, till 1848, when he obtained the appointment of Assistant in the Department of Geology and Mineralogy in the British Museum. In 1845 his scientific merits were so well appreciated that he was selected to fill the Chair of Botany and Natural History including Geology at the Royal Agricultural College at Cirencester; and to this were subsequently added the appointments of Examiner for the Council of Military Education, and of Examiner in Geology to the University of London. Dr. Woodward, though not a contributor to our publications, was the author of numerous papers in various scientific and literary periodicals, for the most part on palæontological, geological, and more especially malacozoological subjects, displaying in all he wrote the utmost

acuteness of observation, combined with the most minute attention to accuracy and truth. But the most valuable as well as the most considerable of the works he contributed to science is the excellent 'Manual of Recent and Fossil Shells,' first published in the years from 1851 to 1856. This work speedily took the very first rank among text-books on the subject—and deservedly so, both by the lucidity of its arrangement, the amazing amount of correct information compressed into a small space, and the great amount of original matter contained in it. The Supplement, more especially, containing a detailed account of the geographical distribution of living Mollusca and of the distribution in time of the fossil forms, is particularly deserving of notice as a monument of the full and accurate information possessed by the author, and as one of the most useful compendiums of what is known on those subjects ever given to the world.

I need say nothing here, where Dr. Woodward was so well known, with respect to his amiable and modest demeanour, and the readiness with which he was at all times willing to aid those who might seek his assistance.

The Secretary also announced that thirty-three Fellows, two Foreign Members, and one Associate had been elected since the last Anniversary.

At the Election which subsequently took place, George Bentham, Esq., was re-elected President; William Wilson Saunders, Esq., Treasurer; and George Busk, Esq., and Frederick Currey, Esq., Secretaries. The following five Fellows were elected into the Council, in the room of others going out:—viz. J. W. Dunning, Esq., Robert Hudson, Esq., J. G. Jeffreys, Esq., Colonel Munro, and William Carruthers, Esq.

Mr. Alfred White, on the part of the Auditors of the Treasurer's Accounts, read the Balance Sheet, by which it appeared that the total Receipts during the past year, including a Balance of £414 19s. 2d. carried from the preceding year, amounted to £1820 16s. 6d., and that the total Expenditure during the same period (including the purchase of an East Indian Railway Debenture for £100) amounted to £1401 14s. 1d., leaving a Balance in the hands of the Bankers of £419 2s. 5d.

June 7, 1866.

George Bentham, Esq., President, in the Chair.

The President nominated J. J. Bennett, Esq., J. D. Hooker, M.D., Sir John Lubbock, Bart., and W. W. Saunders, Esq., Vice-Presidents for the ensuing year.

James Ebenezer Saunders, Esq., was elected a Fellow.

The following Papers were read, viz. :—

1. "On *Myostoma*, a new genus of *Burmanniaceæ*;" by John Miers, Esq., F.R.S. & L.S. (See 'Transactions,' vol. xxv. part 3.)

2. "On two new Genera of *Compositæ* (*Mutisiaceæ*) from India;" by Thomas Thomson, M.D., F.L.S. (See 'Botanical Proceedings,' vol. ix.)

3. "Notes on the New Zealand *Stictæ*;" by W. L. Lindsay, M.D., F.L.S. (See 'Transactions,' vol. xxv. part 3.)

4. "Observations on New Zealand Lichens;" by the same. (See 'Transactions,' vol. xxv. part 3.)

5. "On the Surface-fauna of Mid Ocean.—No. 2. *Foramini-fera*;" by Major Samuel R. J. Owen, F.L.S. (See 'Zoological Proceedings,' vol. ix.)

6. "Characters of some undescribed Heterocerous *Lepidoptera*;" by Francis Walker, Esq., F.L.S. (See 'Zoological Proceedings.')

June 21, 1866.

George Bentham, Esq., President, in the Chair.

Dr. Hermann Becker, the Rev. Dr. Bleasdale, and Wentworth Buller, Esq., were elected Fellows.

Mr. E. J. Simmonds exhibited a small collection of Insects, chiefly *Coleoptera*, formed by himself in Tropical Western Africa.

Dr. Trimen, F.L.S., exhibited living plants of a new British *Lemna* (*L. arrhiza*, W.) gathered by him in a pond at Staines.

The following Papers were read, viz.:—

1. "Sertum Angolense;" by Frederick Welwitsch, M.D., F.L.S. (See 'Transactions,' vol. xxvi.)

2. "On Cortical Cuneate Rays, and their origin;" by George Sigerson, M.D., F.L.S.

3. "Note on the presence of four Cotyledons in a Sycamore;" by the same.

4. "Remarks on the formation of the Root-socket of *Lodoicea Seychellarum*;" by the same.

5. "Observations on Dr. Lindsay's Note on *Arthonia melaspERMella*;" by William Nylander, M.D. Translated and communicated by the Rev. W. A. Leighton, B.A., F.L.S. (See 'Botanical Proceedings,' vol. ix.)

6. "Hypochlorite of Lime and Hydrate of Potash, two new criteria in the study of Lichens;" by the same. (See 'Botanical Proceedings,' vol. ix.)

7. "Notes on some of the smaller Crustaceans.—1. On the Habits of the *Hyperiidæ*;" by Thomas Edward, A.L.S. (See 'Zoological Proceedings,' vol. ix.)

8. "On the Lingual Bands of the West-Indian Gasteropods;" by J. L. Guppy, Esq., and Jabez Hogg, Esq., F.L.S.

9. "On the *Longicornia* of Australia, with a List of all the described Species, &c.;" by Francis P. Pascoe, Esq., F.L.S., F.Z.S., and late Pres. Ent. Soc. (See 'Zoological Proceedings,' vol. ix.)

Receipts and Payments of the Linnean Society from May 1, 1865, to April 30, 1866.

	£	s.	d.
Balance in the hands of the Bankers at the last audit ...	414	19	2
Admission Fees	192	0	0
Compositions	310	0	0
Annual Contributions of £2 2s.	39	18	0
Do. do. of £3 0s.	528	13	0
Transactions and Journal sold	196	19	4
Dividends on Consols	38	7	0
Donation from Executors of Sir W. J. } Hooker	100	0	0
	1405	17	4
	£1820	16	6

	£	s.	d.
Insurance	10	10	0
Repairs and Furniture	27	15	1
Coals, Gas, Tea, Postage, &c.	103	5	11
Salaries	195	0	0
Expenses of the Society's Publications	882	16	2
Books purchased	50	17	11
Bookbinding and Stationery	15	7	3
Commission	14	17	11
	£1300	10	3
Invested in East-India Railway Debenture	101	3	10
Balance in the hands of the Bankers	419	2	5
	£1820	16	6

W. WILSON SAUNDERS, *Treasurer.*

The foregoing Accounts have been examined, and the Balance in hand found to be correctly stated at £419 2s. 5d.

GEORGE BENTHAM, *President.*
GEORGE BUSK, *Secretary.*

R. C. A. PRIOR,
F. P. PASCOE,
E. H. VINEN,
ALFRED WHITE.

May 21st, 1866.

ADDITIONS

TO THE

LIBRARY OF THE LINNEAN SOCIETY.

RECEIVED FROM JULY 1, 1864, TO JUNE 30, 1866.

[*Continued from Vol. VIII. page lxviii.*]

TITLES:

DONORS.

ACADEMIES AND SOCIETIES.

Adelaide, S. A. :—

Philosophical Society.

Annual Report and Transactions, for the year ending
Sept. 30th, 1865. 4to. Adelaide, 1865.

C. A. WILSON, Esq.

Amsterdam :—

Congrès International de Botanique et d'Horticulture en
1865. 8vo. Rotterdam, 1866. THE CONGRESS.

Kon. Akademie van Wetenschappen.

Verhandelingen, Deel 10. 4to. Amsterdam, 1864.

Verslagen en Mededeelingen. Afdeeling Natuurkunde,

Deel 17, und Afd. Letterkunde, Deel 8. 8vo. *Ib.*, 1865.

Jaarboek voor 1863 & 64. 8vo. *Ib.*

THE ACADEMY.

LINN. PROC.—Session 1865–66.

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	TITLES.	DONORS.
ACADEMIES AND SOCIETIES (<i>continued</i>).		
Basel:—		
	Naturforschende Gesellschaft.	
	Verhandlungen. Theil 4, Heft 1 & 2. 8vo. Basel, 1864–66.	THE SOCIETY.
Batavia:—		
	Bataviaasch Genootschap van Kunsten en Wetenschappen.	
	Verhandelingen, Deel 30 & 31. 4to. Batavia, 1863–64.	
	Tijdschrift voor Indische Taal-, Land-, en Volkenkunde, Deel 13, & 14, Afl. 1–4. 8vo. <i>Ib.</i> , 1863–64.	
	Notulen van de Algemeene en Bestuurs-Vergaderingen van het B. G., Deel 1 (Afl. 1–4). 8vo. <i>Ib.</i> , 1863–64.	THE SOCIETY.
	Natuurkundig Vereeniging in Nederlandsch Indie.	
	Natuurkundig Tijdschrift voor Nederl. Indie. Deel 26, 27, & 28, Afl. 1–3. 8vo. Batavia, 1864–65.	THE ASSOCIATION.
Bath:—		
	Microscopical Society.	
	Extracts from the Minutes of. Nos. 1 & 2. 8vo. Bath, 1862–66. J. W. MORRIS, Esq., F.L.S.	
Berlin:—		
	Botanischer Verein für die Provinz Brandenburg.	
	Verhandlungen. Jahrgang 1–6. 8vo. Berlin, 1859–64.	THE SOCIETY.
	Kön. Akademie der Wissenschaften.	
	Abhandlungen, aus den J. 1863 & 1864. 4to. Berlin, 1864–65.	
	Monatsberichte, aus den J. 1864–66. 8vo. <i>Ib.</i> , 1865–66.	
	Verzeichniss der Abhandlungen gelehrter Gesellschaften, &c., in der Bibliothek der Akademie. 8vo. <i>Ib.</i> 1864.	THE ACADEMY.
	Verein zur Beförderung des Gartenbaues in der Kön. Preus- sischen Staaten.	
	Wochenschrift; redigirt vom Prof. Dr. K. Koch. Jahrg. 7 & 8, & Jahrg. 9, Nos. 1–15. 4to. Berlin, 1864–65.	THE SOCIETY.
Bologna:—		
	Accademia delle Scienze.	
	Rendiconto, 1859–60, 1860–61, 1861–62, 1862–63, & 1863– 64. 8vo. Bologna, 1860–64.	THE ACADEMY.

TITLES.

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ACADEMIES and SOCIETIES (*continued*).

Bombay:—

Government Observatory.

Magnetical and Meteorological Observations, made in 1863.

4to. Bombay, 1864.

SECRETARY OF STATE FOR INDIA IN COUNCIL.

Bonn:—

Naturhistorischer Verein der Preussischen Rheinlande, &c.

Verhandlungen. Jahrgang 21 & 22. 8vo. Bonn, 1864-65.

THE ASSOCIATION.

Boston, Mass. (*See also Cambridge*):—

American Academy of Arts and Sciences.

Proceedings, Vol. 6, Sheets 11-38. 8vo. 1863-64.

THE ACADEMY.

Society of Natural History.

Journal, Vol. 7, No. 4. 8vo. Boston, 1863.

Proceedings, Vol. 9, Sheets 12-25. 8vo. *Ib.*, 1863-65.

THE SOCIETY.

Brünn:—

Naturforschender Verein.

Verhandlungen, Bd. 2 & 3. 8vo. Brünn, 1864-65.

THE ASSOCIATION.

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| Additional photographs of the skeleton of <i>Dinornis robustus</i> , one of the Moas of New Zealand. | THOMAS ALLIS, Esq., F.L.S. |
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| G. Bentham, Esq., R. Brown, Esq., T. Bell, Esq., C. C. Babington, Esq., Jacob Bell, Esq., R. Bentley, Esq., Rev. M. J. Berkeley, Wm. Borrer, Esq., F. Boott, M.D., Geo. Bennett, M.D., H. Cuming, Esq., Jno. Curtis, Esq., C. Daubeny, M.D., J. E. Dennes, Esq., Jno. Forster, Esq., J. Gaskoin, Esq., J. Gould, Esq., P. H. Gosse, Esq., J. E. Gray, Ph.D., R. E. Grant, M.D., E. Hamilton, M.D., A. Henfrey, Esq., Jno. Hogg, Esq., Capt. Holman, J. D. Hooker, M.D., T. Horsfield, M.D., R. Hudson, Esq., Jno. Lindley, Ph.D., and R. C. Alexander Prior, M.D. | |
| Portrait (photograph) of Professor Bertoloni, F.M.L.S., in the 90th year of his age. | Messrs. MAULL and Co. |
| Prof. CAPELLINI, on the part of the Committee. | |

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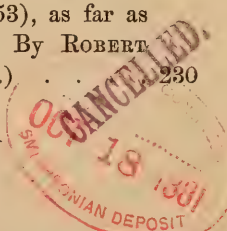
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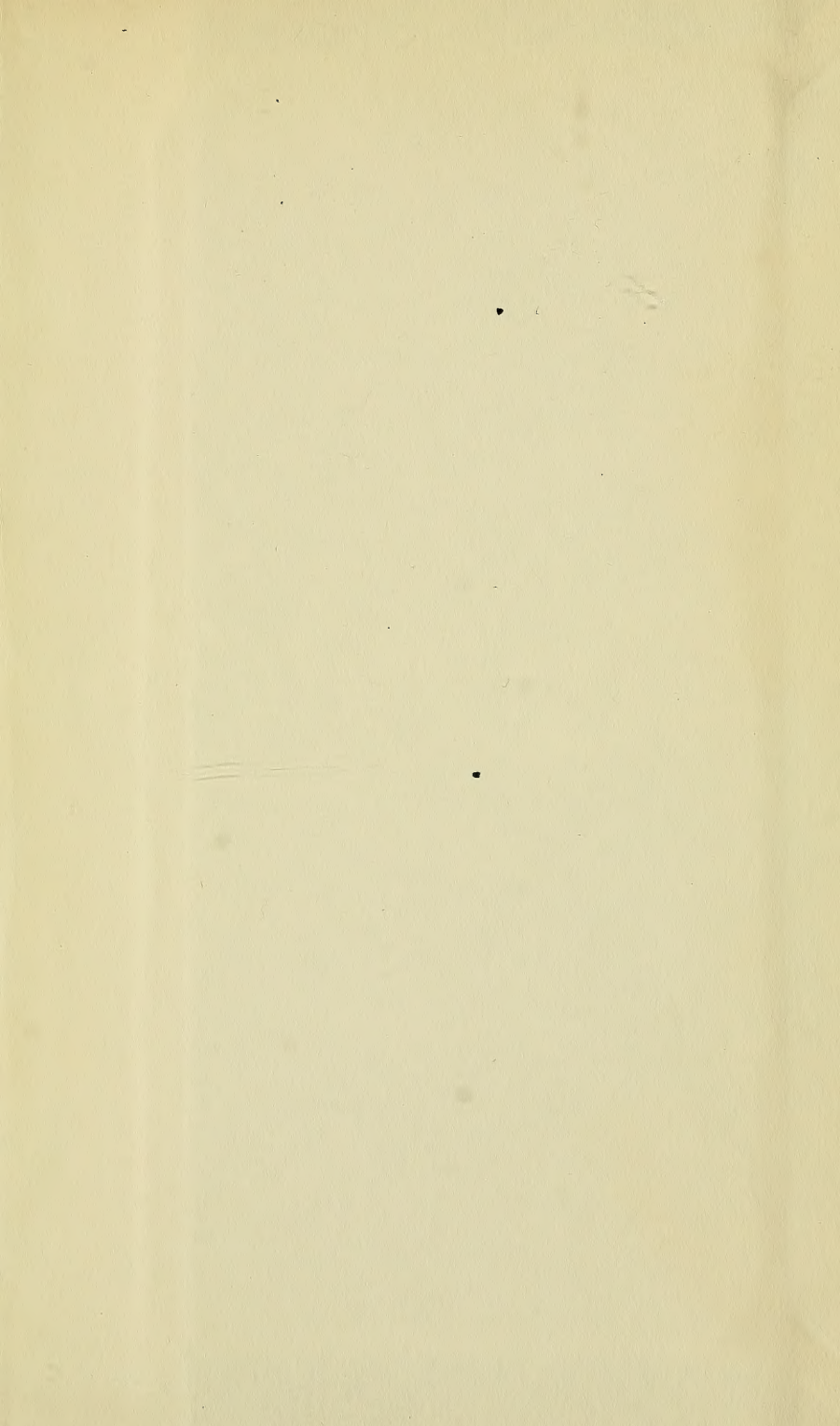
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